S. HRG. 103–398

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION AUTHORIZATION

Y 4. C 73/7: S. HRG. 103-398

National Oceanic and Atmospheric Ad...

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED THIRD CONGRESS

FIRST SESSION

JUNE 22, 1993

Printed for the use of the Committee on Commerce, Science, and Transportation

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CONTENTS

	Page
Opening statement of Senator Hollings	2
Opening statement of Senator Kerry	1

LIST OF WITNESSES

Baker, Hon. D. James, Under Secretary of Commerce for Oceans and Atmosphere, National Oceanic and Atmospheric Administration	3
Prepared statement	6
Burris, John E., Ph.D., Director and Chief Executive Officer of the Marine Biological Laboratory, Woods Hole, MA	29
Prepared statement	31
Helms, Bennett, Chief Executive Officer, Atlantic Little Neck Clam Farms, Inc	33
Pell, Hon. Claiborne, U.S. Senator from Rhode Island	36
Silva, Mark, Research Director, American Proteins, Sandwich, MA	34

APPENDIX

Questions asked by Senator Pressler and answers thereto by Dr. Baker	51

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION AUTHORIZATION

TUESDAY, JUNE 22, 1993

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The committee met, pursuant to notice, at 9:35 a.m. in room SR–253, Russell Senate Office Building, Hon. John F. Kerry, presiding.

Staff members assigned to this hearing: Penny D. Dalton and Lila H. Helms, professional staff members; and John A. Moran, minority staff counsel.

OPENING STATEMENT OF SENATOR KERRY

Senator KERRY. This hearing of the National Ocean Policy Study will come to order. Good morning to all. We meet today to address NOAA's budget and to discuss some of the fiscal priorities for 1994.

I am very pleased to welcome Dr. Jim Baker, the new Under Secretary for Oceans and Atmosphere, and accompanied by Assistant Secretary Doug Hall and the NOAA Comptroller Mr. Andrew Moxam, we appreciate your being here. In addition, we will have a second panel which is going to examine some of the issues surrounding marine biotechnology. We welcome three witnesses for that panel: Mr. Bennett Helms from South Carolina; Mr. Mark Silva from Sandwich, MA; and Dr. John Burris who is the Director of the Marine Biological Laboratory at Woods Hole, MA; they will talk to us about some of the tangible benefits of legislation that we are going to be introducing.

I am particularly pleased to be able to welcome Dr. Burris here, especially in light of the efforts that this committee has made to support the research going on there, as well as the new Marine Resources Center of which I was privileged to attend the opening last June. Needless to say, the work that has been done at the laboratory over the years is exciting and important to all of us.

I am not going to make lengthy remarks. There seems to be a repetitious syndrome with respect to the NOAA budget. Each year we meet to discuss the budget, and each year we seem to confront exactly the same set of issues, which is basically a debate structured by the fact that there is too much to do in this area and too few resources being allocated to do it. This is true whether the issue is national efforts to research climate change or the issue to provide radar coverage for weather prediction and the dangers that go with our inability to do that. Whether it is the diminishing capacity of the NOAA fleet with its increasingly aging ships, an issue that has been lamented here in this committee on a number of dif-

ferent occasions but which has not significantly changed, or whether it is coastal or fisheries management.

Each and every one of these areas is underfunded and struggling, and it is not something that you are unaware of. The restraints are placed on you departmentally, and it is a tough battle, as we all know.

But it somehow strikes me as being more difficult this year because of the investment package issue with the defeat of the President's economic stimulus plan. We have a significant number of items that were taken out of the budget under the cap and proposed for funding as investments. Now the appropriations allocation is not adequate to those programs, and we are looking for about $243 million, which is going to have to be found elsewhere in the budget. That has worsened an already bad budget situation. Mr. Chairman, your comments, please.

OPENING STATEMENT OF SENATOR HOLLINGS

Mr. CHAIRMAN. Today the committee will look at the budget and policy decisions facing the new management team at the National Oceanic and Atmospheric Administration. In addition, the hearing will focus on a specific issue of growing national interest, marine biotechnology.

NOAA was established in 1970 at the recommendation of the Stratton Commission on Marine Science, Engineering and Resources. The agency was created in response to, in the words of the Stratton Commission, a growing "conviction that the time had arrived for this country to give serious and systematic attention to our marine environment and to the potential resources of the oceans." Over the years, NOAA has become the Nation's primary civilian agency to collect information about our oceans and atmosphere. Recent events, like the grounding of the *Queen Elizabeth II,* the discovery of ozone depletion in the Arctic, and March's "storm of the century" demonstrate the importance of such information. Through its observation and assessment programs, NOAA has monitored the Earth's environmental pulse, and over the years the agency has done its job well.

Today, NOAA is at a critical turning point. For the past 12 years, the agency struggled for survival within an administration that was often indifferent to NOAA's marine and coastal management responsibilities. Each year, key programs were proposed for reductions or terminations, and it was up to Congress to restore funding. Now, Secretary of Commerce Brown has voiced new interest in and support for NOAA's programs and missions. The real challenge will be to move the agency's agenda forward in the face of overwhelming deficit realities. Thus, I reaffirm my interest in the identification by the new NOAA leadership of two or three priorities on which we can proceed expeditiously.

One of those priorities could well be marine biotechnology. This field is one that unlocks the secrets of the cell, enabling us to use marine resources in developing new products and processes. Marine biotechnology also could give us tools to manage marine resources more wisely and effectively.

Despite proven application in diverse areas such as manufacturing, aquaculture, pharmaceuticals, seafood safety, fisheries man-

agement, and environmental cleanup, marine biotechnology simply is not receiving the full support which it deserves from NOAA and other Federal agencies. While biotechnology is the largest of the Government's interagency research initiatives, with annual funding of about $4 billion, only about 1 percent of that amount is available for marine research. I encourage the administration to examine carefully the promise of marine biotechnology and to develop a plan to maintain U.S. leadership. I also encourage NOAA to expand its ongoing efforts in this area, and particularly the research, technology transfer, and education programs of the National Sea Grant Program. When the Stratton Commission challenged the Nation to explore the secrets of the ocean frontier, it was with the expectation that we would discover revolutionary new uses for the knowledge we obtained. Marine biotechnology offers that kind of revolutionary potential.

I welcome Under Secretary Baker and our other witnesses today to discuss this important issue and the many other challenges facing NOAA.

Thank you, Mr. Chairman.

Senator KERRY. Thank you, Mr. Chairman. We obviously are interested today in examining exactly how we are going to deal with the budget situation without losing some of NOAA's capacity, and we welcome you here for those purposes.

Why do we not just dig right into it? Dr. Baker, if you want to lead off with your testimony we would appreciate it.

STATEMENT OF HON. D. JAMES BAKER, UNDER SECRETARY OF COMMERCE FOR OCEANS AND ATMOSPHERE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D.C.; ACCOMPANIED BY DOUGLAS HALL, ANDREW MOXAM, DR. NANCY FOSTER, AND DR. ELBERT FRIDAY

Dr. BAKER. Thank you, Senator Kerry. It is a pleasure to be here.

Senator KERRY. Let me say before you begin, if I may, I want to express my appreciation to you and to Doug Hall for what I thought was a terrific response of Government to a bad governmental decision initially. But I think you folks handled it well. You acknowledged that things were not handled well. We did not get a lot of stonewalling.

On the contrary, we got a responsive, open approach, frank sort of admission that something had goofed up along the road, and I thought a very beneficial effort of outreach that, while it has not solved all of the problems and brought everybody into the fold, it has gone a long way to addressing what was received to be an egregious situation, and I want to thank you for that and congratulate you for that.

We can beat you up sometimes from this rostrum and pound away, but I think it is also appropriate and important for us to recognize good efforts when they are made, and I think you made a good effort on that and I thank you for it.

Dr. BAKER. Thank you, Senator Kerry.

Doug was on the scene there, and he provided some outstanding decisionmaking as he looked at the issues and came to what I think we all agree was the right decision about what we should do.

I am very pleased to have him on our NOAA team and hope that we can continue to operate in that mode.

I am pleased to be here with the NOAA management team in my first appearance before you here and to thank you for your leadership in providing help for NOAA over the years, and also to the staff that is here, the congressional staff who have helped me so much over the years when I was outside the system and providing a lot of guidance as we try to get adjusted now to being on the inside. I would also like to say it is a pleasure for me to be on the same set of panels with John Burris, who was a student of mine at Harvard when I was assistant professor there. And I was pleased to see how he has moved up through the system and is now appearing, giving congressional testimony.

Senator KERRY. Are you taking credit for his capability? [Laughter.]

Dr. BAKER. I am taking full credit for that. [Laughter.]

As you know, the total NOAA request for fiscal year 1994 is about $1.92 billion. Of that total, $1.76 billion are in the operations research and facilities appropriations, about $79.1 million in construction, $23.1 million in fleet modernization, shipbuilding, and conversion appropriation, and $2.95 million are requested for fisheries funds.

The budget includes a total transfer of $62.9 million from the account to promote and develop fisheries products and research, and the damage assessment and restoration revolving fund as offsets to the operations research and facility account.

We believe that our budget request ensures that the agency continues to meet the urgent environmental needs of the 1990's as embodied in four major areas: first, to continue modernization of the Nation's weather services; second, to maintain critical operations in fisheries, ocean and coastal management, oceanic and atmospheric research, weather services, and satellites; third, to invest in global change research and high-performance computing and communications; and, fourth, to implement administrative savings and reductions.

The fiscal year 1994 request contains an investment increase of about $217 million for weather service modernization that allows NOAA to proceed with the Modernization and Associated Restructuring Demonstration and Implementation, Next Generation Weather Radar Program, Weather Forecast Office construction, the Advanced Weather Interactive Processing System, the central computer facility upgrade, the Automated Service Observing Systems, our Geostationary Operational Environmental Satellites, and the Polar Orbiting Environmental Satellites.

Our agenda for the 1990's will focus on environmental stewardship responsibilities, as well as improving our assessment and prediction capabilities in an effort to protect and enhance the natural and living marine resources of the Nation. This work, including research to support science-based policy options, will become increasingly important as Congress reauthorizes the Endangered Species Act, the Magnuson Fisheries Conservation and Management Act, and the Marine Mammal Protection Act.

The fiscal year 1994 request includes increases totaling $46.5 million to maintain ongoing operations and fulfill basic responsibil-

ities in fisheries, ocean services, weather, and satellite services. Without these funds, NOAA's ability to address natural and living marine resource issues will be severely reduced.

Our fiscal year 1994 request includes an increase of $20.3 million for weather service operations funding in 1994 to maintain the current level of weather services to the public as required by Public Law 102–567, which addresses weather service modernization.

The fiscal year 1994 request of $224 million for the National Marine Fisheries Services provides increased funding of $11.9 million needed to maintain essential ongoing operations of the National Marine Fisheries Service. This funding is necessary to avoid significant downsizing which would result in staff reductions and the closure of some of the fisheries facilities. The consequence of downsizing would impact every geographic region and the management of most major fisheries.

Program increases of $3.5 million in the fiscal year 1994 budget request of $149 million are essential for maintaining current operations and staffing for the National Ocean Service.

Increased funding totaling $7.7 million in the Oceanic and Atmospheric Research request of $214 million would be used to maintain ongoing activities in several areas. Included in the research request is an increase of $2.1 million for activities of the Regional Marine Research Program.

Our fiscal year 1994 request includes an increase of $23 million for NOAA's Climate and Global Change Program to continue high-priority research programs supported in fiscal year 1993 with moneys appropriated to the Department of State and subsequently transferred to NOAA. An increase in funding would also allow NOAA to begin implementing U.S. support for the International Research Institute for Climate Prediction, a commitment the United States made at the United Nations Conference on Environment and Development held in June 1992 in Rio. The fiscal year 1994 request also includes $2.6 million for the FCCSET program in high-performance computing and communications.

As part of the President's commitment to cutting the cost of the Federal Government and the size of the workforce, NOAA will achieve administrative savings of $25.6 million in fiscal year 1994. In order for NOAA to deliver more focused service, the fiscal year 1994 budget includes $66.9 million in program decreases for programs that benefit only small groups, are not NOAA's statutory responsibility, are one-time expenditures whose purpose has been achieved, are lower priority activities, or are construction projects that no longer require funding.

This is our package for fiscal year 1994. It reflects our preliminary effort to reevaluate the agency's mission and priorities. In pursuit of President Clinton's goals of a sound economy and exemplary service, and in recognition of the increasing importance of science in policy deliberations, we at NOAA are developing a strategic plan which focuses on NOAA's stewardship responsibilities and NOAA's environmental assessment and prediction capabilities. I believe that NOAA is capable of providing improved information which will strengthen the scientific foundation upon which our sister Department of Commerce agencies, as well as other Federal agencies, can base critical economic and environmental decisions.

I would like to say just a few words to briefly discuss the importance and potential of marine biotechnology. Marine biotechnology is the use of marine organisms or their components to provide products and services. The application of traditional biotechnology techniques in the marine realm is already showing the potential to sustain and enhance the production of valuable living marine resources while also offering a new, rich, source of potentially valuable commercial and medical chemicals.

A few possible applications of marine biotechnology include aquaculture production, bioremediation—for example, pollution consuming bacteria—diagnostic seafood safety testing, fish stock population genetic control, and new industrial and biochemical products. If the oceans are to continue to provide a bounty of natural resources for the use of mankind, we must find full and innovative ways to utilize and replenish their resources, and we believe that marine biotechnology can offer this opportunity.

Mr. Chairman, thank you for giving me this opportunity to present the NOAA fiscal year 1994 budget request. I would be happy to answer any questions the committee may have.

[The prepared statement of Dr. Baker follows:]

PREPARED STATEMENT OF DR. D. JAMES BAKER

Mr. Chairman and members of the Committee, I am pleased and honored to appear before you today in support of the FY 1994 budget request for the National Oceanic and Atmospheric Administration (NOAA).

The total NOAA request for FY 1994 is $1.92 billion. Of the total, $1.76 billion are in the Operations, Research and Facilities (OR&F) appropriation, $79.1 million are in the Construction appropriation, $23.1 million are in the Fleet Modernization and Shipbuilding and Conversion appropriation, and $2.95 million are requested for fisheries funds. The budget includes a total transfer of $62.9 million from the Promote and Develop Fisheries Products and Research account and the Damage Assessment and Restoration Revolving Fund as offsets to the OR&F account.

The National Oceanic and Atmospheric Administration's FY 1994 budget request ensures that the agency continues to meet the urgent environmental needs of the 1990's, as embodied in four broad priorities:

- First, to continue modernization of the Nation's weather services—an investment increase of $217.4 million;
- Second, to maintain critical operations in fisheries, ocean and coastal management, oceanic and atmospheric research, weather services, and satellites—$46.5 million;
- Third, to invest in global change research and high performance computing and communications—investment increases totalling $25.6 million;
- Fourth, to implement administrative savings and reductions—decreases totalling $92.5 million.

NOAA's priorities are critical activities that serve the Nation and support the Administration's goals. As articulated in Vision of Change for America, "The Administration's initiatives offer certain proof that environmental protection and economic growth can—and must—go hand in hand."

NATIONAL WEATHER SERVICE MODERNIZATION AND SYSTEMS FUNDING

Completion of the weather service modernization (satellites, observing and processing systems, workforce transition, and construction of Weather Forecast Offices) is a high priority of the Administration. Modernization has already provided a substantial measure of additional safety to our Nation's citizens, in terms of lives saved and damages averted. Its success is demonstrated in the dramatic increase in warning time as well as a significant reduction in false alarms for severe weather when the modernized, as opposed to traditional, equipment is used. More accurate and reliable weather warnings save lives. NOAA's weather research also has led to significant improvements in our ability to forecast the track of hurricanes. Accurate predictions allowed the Nation to prepare for Hurricanes Andrew, Hugo, and Iniki, reducing the potential loss of human life. Recently, NOAA predicted the timing and severity of the East Coast "Storm of the Century" days in advance.

According to a cost/benefit study done by NIST, the modernization, once completed, will provide benefits valued at $7 billion per year that include: 1) an enhancement in weather information provided to the public; and 2) an increase in benefits to the American economy due to improvements in weather and stream flow forecasting. This enables decision makers in various sectors of the economy (e.g., aviation, agriculture, construction, and manufacturing) to take action to avoid weather-caused losses and unnecessary preparedness costs due to false alarms.

The FY 1994 request of $673.1 million for the National Weather Service (NWS) and $429.2 million for the National Environmental Satellite, Data and Information Service allows NOAA to continue the modernization program, provide critical weather services including local warnings and forecasts, and maintain all current services of the NWS at their present levels. The FY 1994 request allows the NWS to maintain operations while meeting the conditions outlined in Public Law 102-567, which establishes requirements for the commissioning and decommissioning of equipment, and the staffing, certifying and restructuring of all field offices.

The FY 1994 request contains an increase of $217.4 million for weather service modernization that allows NOAA to proceed with the following components of the program:

- Modernization and Associated Restructuring Demonstration and Implementation (MARDI) provides funds: to staff and train personnel required to operate and commission Next Generation Weather Radar (NEXRAD) units to improve significantly severe weather warning capabilities; to provide funding necessary to prepare for a multi-site operational demonstration; and, to support the certification requirements contained in section 706 of Public Law 102-567. Recent delays in the transition to modernized operations make it critical now to expedite Weather Forecast Office and River Forecast Center staffing and training, as well as associated system work. This acceleration is needed to close the gap between facilities construction and major system deployments—and the corresponding internal NWS operational transition neededto fully use these capabilities. Our request proposes acceleration of the transition to bring modernization components into closer alignment in FY 1994. An increase of $52.5 million is requested.
- Next Generation Weather Radar (NEXRAD), with Doppler capability, will provide nationwide radar coverage, improve detection of severe weather and flash floods, reduce false alarm rates, increase warning lead time, and replace the existing obsolete radar network. An increase of$40.6 million is requested for acquisition and deployment.
- Weather Forecast Office (WFO) construction provides for the acquisition, construction, or renovation of the office facilities of the modernized and restructured National Weather Service. An increase of $14.7 million is requested.
- The Advanced Weather Interactive Processing System (AWIPS/NOAAPORT) will enable local forecasters to integrate, process, and transmit high volume radar, satellite, upper air, surface observation data, and guidance information, provide communications capability for internal and external users, and remap GOES (satellite) data to significantly improve forecasting capabilities. An increase of $29.7 million is requested.
- The Central Computer Facility upgrade, including acquisition of a Class VII supercomputer, will improve weather prediction modeling, and increase accuracy of centralized forecast guidance products. The increased capabilities of the requested computer system are necessary to execute, in a timely manner, the mesoscale prediction models that are essential to support the NWS modernization. An increase of $3.1 million is requested.
- Automated Surface Observing Systems (ASOS) will reduce time-consuming manual observations, provide continuous weather watch, and yield increased staff productivity. An increase of $0.6 million is requested.
- The Geostationary Operational Environmental Satellites (GOES) request provides for the continued procurement of GOES I-M satellites, instruments and ground systems that are the primary source of advance warnings of hurricanes and other severe weather events. An increase of $66.2 million is requested.
- The Polar-Orbiting Environmental Satellites (POES) request provides for the continued procurement of replacement spacecraft and instrument payloads necessary to maintain a constellation of two global environmental satellites until the early 2000's. At that time the Europeans will assume responsibility for the morning coverage, with NOAA and European payload contributions. Continuity will thereby be assured. An increase of $10 million is requested.

With regard to the last two systems, there have been adjustments to previously announced launch dates:

- The GOES-I launch was anticipated to be in the middle of April next year. When NASA went to General Dynamics (the launch services contractor) to negotiate

the date, it was learned that there was a conflict with a previously scheduled launch of a commercial satellite. General Dynamics has proposed a June launch, but NASA is working to accelerate this date. There is no cost impact due to this possible slip. It is one of scheduling the launch pad and does not represent any technical problems with the GOES-I satellite. GOES-I is on schedule for a February 1994 delivery to the launch site.

• During final testing of the NOAA-I polar spacecraft prior to its anticipated launch date of June 9, 1993, an anomaly was detected in a gyroscope in the spacecraft's Inertial Measurement Unit (IMU). We immediately shipped a replacement unit to the contractor, Honeywell1 for calibration. However, this unit failed its calibration testing. We are working with NASA and the contractor to determine an acceptable IMU for NOAA-I and the earliest possible launch date for NOAA-1 is mid-July.

MAINTAIN CRITICAL OPERATIONS IN FISHERIES, OCEAN SERVICES, THE WEATHER SERVICE AND SATELLITE PROGRAMS

NOAA's agenda for the 1990's includes environmental prediction and assessment and stewardship of the Nation's natural and living marine resources. This work, including research to develop science-based policy options, cannot be undertaken without proper funding. Support for science-based policy options will become increasingly important as Congress reauthorizes the Endangered Species Act, Magnuson Fisheries Conservation and Management Act, and Marine Mammal Protection Act. Total NOAA funding of$46.5 million to maintain on-going operations is needed to fulfill basic responsibilities in fisheries, ocean services, weather and satellite services. Without these funds, NOAA's ability to address natural and living marine resource issues will be severely reduced.

The FY 1994 request includes an increase of $20.3 for NWS operations funding in FY 1994 to maintain the current level of weather services to the public as required by Public Law 102-567, which addresses the NWS Modernization.

Over the past four years, NWS has not been able to maintain public weather services and operation of all NWS offices within appropriated funding levels. To prevent service reductions, the Congress concurred with three reprogrammings and provided supplemental funding to maintain services. Again in FY 1993, NWS continues operations at minimal levels and a review of options that addresses the shortfall in NWS funding, is currently underway.

During FY 1992, the NWS developed a recovery plan involving temporary, one-time efforts, to bridge the cumulative gap between available funding and NWS operational requirements. However, this plan requires that NWS receive full funding of this FY 1994 initiative. Without funding of this FY 1994 initiative, permanent service reductions will be required. Equipment replacement and repair cannot continue to be deferred while repair costs and failure rates of aging equipment continue to escalate. The permanent reductions to current services include employee reductions, reductions in service hours, and office closures. These actions will also put the NWS Modernization and Restructuring effort into jeopardy, in that, the NWS Base Operations must be healthy prior to full commitment and full implementation of any reorganization or restructuring.

While the FY 1994 request of $224 million for the National Marine Fisheries Service (NMFS) does not propose any funding for new or expanded programs, it does provide funding of $11.9 million needed to maintain essential on-going operations of NMFS. This funding is necessary to avoid significant downsizing involving over 270 employees and the closure of a number of NMFS facilities.

Downsizing would significantly compromise NMFS' capacity to fulfill its present responsibilities and mandates. The result would be a loss of scientific expertise, data and information in every geographic region and would impact the management of most major fisheries. Downsizing would delay critical conservation activities, including the implementation of Fishery Management Plans, allocation adjustments and the development, review and implementation of ESA listing and recovery plans.

Additionally, the reauthorization of the Endangered Species Act, the Magnuson Fisheries Conservation and Management Act and the Marine Mammal Protection Act may result in increased responsibilities being placed on NMFS in FY 1994 such as those specified in previous reauthorizations (e.g., Secretarial responsibility for Atlantic highly migratory pelagic fishery management). It is critical to ensure adequate funding for NMFS' on-going activities before increased responsibilities are added.

Program increases of $3.5 million in the FY 1994 budget request of $148.8 million are essential for maintaining current operations and staffing for the National Ocean Service (NOS). Without the basic operational funds requested, NOS would be forced

to cut back on geodetic activities related to the National Geodetic Reference System, necessary for the rebuilding of the Nation's infrastructure. Moreover, there would not be sufficient funds to operate and maintain the tide gauges, resulting in degradation of the network. This in turn would lead to deterioration in the accuracy of tide predictions, nautical charts, and storm surge predictions. The Circulatory Program would not be able to keep pace with circulation changes in the Nation's estuaries, bays and coastal areas. These impacts could result in a visible drop in the quality of the tide and current tables which are vital for the safety of maritime commerce. Finally, the requested increase would enable NOS to continue to analyze and distribute global sea level data and products derived from satellite altimeter measurements.

Increased funding totalling $7.7 million in the Oceanic and Atmospheric Research (OAR) FY 1994 request of $214.1 million would be used to maintain on-going activities in several areas. The funds would maintain the global greenhouse gas measurements program and address scientific issues associated with the Clean Air Act Amendments of 1990. The funds would reinstate advanced forecast development and refine remote sensing technologies for observing and predicting severe weather and precipitation conditions. They would fund full operation (24 hours/day, 7 days/week) of the Space Environmental Services Center which provides space weather data, forecasts, and warnings crucial to satellite operations, space exploration, international navigation, high altitude polar flights, high frequency radio communications, remote surveillance, and electric power distribution. Included in the OAR request is an increase of $2.1 million for activities of the Regional Marine Research Program. This funding would provide peer-reviewed research proposals to increase understanding and assessment of our Nation's marine environments and resources.

Full funding of $145 million should be provided for Program Support otherwise-the administrative services supporting all NOAA line offices such as procurement, personnel and grants administration will be adversely affected.

INVESTMENTS IN THE FUTURE

Funding for investments in FY 1994, tailored to our global environment, is another high priority of both NOAA and the Administration.

Highlighted at the United Nations Conference on Environment and Development (UNCED) held in June 1992, global issues are addressed by the U.S. Global Change Research Program (USGCRP) of which NOAA's Climate and Global Change Program plays an important role. The document Putting People First notes that the United States must "Exert international leadership to advance our own nation's interest in a healthier global environment, a stable global climate, and global biodiversity."

NOAA's FY 1994 request includes an increase of $23 million for NOAA's Climate and Global Change Program, bringing the total funding for the program to $70 million. Of the $23 million requested, $19 million would be used to continue high-priority research programs supported in FY 1993 with monies appropriated to the Department of State and subsequently transferred to NOAA. The remaining $4 million would allow NOAA to begin implementing U.S. support for the International Research Institute for Climate Prediction, a commitment the United States made at UNCED.

The request allows the agency to continue its contribution in government-wide programs that are integrated by the Federal Coordinating Council for Science, Engineering and Technology (FCCSET). The Climate and Global Change programs include observational and research activities that provide insights into critical Earth System problems. These insights have significant long-term benefits. Work would be pursued in such areas as atmospheric chemistry, the role of the ocean in climate change, and long-term climate change modeling which will eventually allow the Nation to predict reasonably long-term climate change.

The FY 1994 request includes $2.6 million for the FCCSET program in High Performance Computing and Communications (HPCC). These funds would make possible major improvements in the Nation's ability to forecast weather and predict climate change, while at the same time, stimulating gains in U.S. industrial competitiveness through the use of evolving high performance computing and high speed networking technologies. More accurate and more timely assessment of the future impact of climate change would be possible. Finer resolution in global and regional models will result in improved weather forecasting and warning services, especially for hazardous weather and flight safety.

NOAA's ocean budget for FY 1994 includes continued support for its crosscutting Coastal Ocean Science Program's efforts to improve predictions and information delivery in the areas of fisheries productivity, coastal environmental quality, and

coastal flooding. Over the last three years, this program has enhanced NOAA's ability to provide the scientific basis for coastal environmental decisions. In FY 1994, NOAA will continue to lead Federal interagency coordination of U.S. coastal ocean science activities.

RECOGNIZING THE IMPORTANCE OF OTHER NOAA PROGRAMS

I want to emphasize that for the first time in 12 years, funding requests have not been reduced for the Sea Grant Program and the Coastal Zone Management (CZM) Program. The funding request for these two important programs, $39.8 million for Sea Grant and $33.5 million for CZM will assure the continuation of these activities. Also, more states and territories are expected to participate in the CZM Program in FY 1994.

For the first time, the National Undersea Research Program (NURP) is included in the President's budget request. Funding of $2 million has been proposed to continue core work undertaken with the ALVIN submersible and deep diving facilities, research in diving safety, and technology development.

FLEET MODERNIZATION STATUS

Modernization of the NOAA fleet began in FY 1992 and continues through FY 1994 with: the performance of critical and routine maintenance; the identification of detailed repair and construction requirements; the preparation of design and technical specifications; the transfer of two nearly new, surplus Navy ships and the conversion of one of those ships to support oceanographic research; and the performance of repairs-to-extend the service life of one N0AA ship. NOAA requests $23 million for the Fleet Modernization Program, a decrease of $4.5 million from the FY 1994 base. Funds appropriated in FY 1993, in addition to the FY 1994 request, will be sufficient to continue the fleet modernization program. The Administration is reviewing the options for the Fleet Modernization Program.

CONSTRUCTION

The Construction account began in FY 1992 and continues through FY 1994 with a net decrease of $12.5 million. NOAA requests a $14.7 million increase to continue the Weather Forecast Office (WFO) facilities modernization program. NWS modernization systems are now being deployed, and it is necessary that the facilities modernization keep pace to support the transition program. More than offsetting this increase are decreases of $27.2 million for eight construction projects that no longer require funding.

ADMINISTRATIVE SAVINGS AND TERMINATIONS

NOAA has assumed its share of the responsibility for deficit reduction by proposing administrative and personnel savings. As part of the President's commitment to cutting the cost of Federal Government and the size of the workforce, NOAA will achieve savings of $25.6 million in FY 1994.

In order for NOAA to deliver more focused service, the FY 1994 budget includes a total of $66.9 million in program decreases for programs that benefit only small groups; are not NOAA's statutory responsibilities; are one-time expenditures whose purpose has been achieved; or are lower priority activities. This figure includes the decrease of $27.2 million in the Construction account, as already noted. Support for NOAA's basic program is essential. For instance, in FY 1994, the NMFS budget request contrasts dramatically from previous budget proposals which proposed reductions of up to 60 percent of base NMFS programs. The particular program cuts proposed by the Administration in FY 1994 are intended to minimize any adverse effects on our ability to fulfill our responsibilities.

This is NOAA's package for FY 1994. It reflects our preliminary effort to reevaluate the Agency's mission and priorities. In response to President Clinton's goals of a sound economy and exemplary service, as well as increased recognition of the importance of science in policy deliberations, we have developed a preliminary strategic plan for fulfilling what we perceive as NOAA's role in the 21st century. We believe our focus on NOAA's stewardship responsibilities and environmental assessment and prediction capabilities will promote more effective and efficient utilization of Agency resources and enable us to fulfill the increasing demand for science-based policy decisions. Consensus on competing economic and environmental concerns will require the best available scientific information. NOAA is capable of providing much of this critical information and can improve the scientific foundation upon which our sister DOC agencies, as well as other government organizations, can base critical economic and environmental decisions.

If the Committee permits, I would also like to take this opportunity to briefly discuss the importance and potential of marine biotechnology. Biotechnology is listed as one of the Administration's five Presidential initiatives identified by the Federal Coordinating Council for Science, Engineering, and Technology as critical to the Nation's future technological strength, economic growth, and health and quality of life. If the oceans are to continue to provide a bounty of natural resources for the use of mankind, we must find new and innovative ways of using and replenishing their resources. The application of marine biotechnology provides the potential to sustain and enhance production of marine resources. Marine biotechnology is the application of the techniques of cellular and molecular biology to marine organisms. The evolution of marine species and their adaptability to unique ecosystems within the ocean realm hold within their genetic, chemical and biological structures a wealth of information which are assisting us in identifying solutions to many unsolved problems. A few examples of possible applications of marine biotechnology include aquaculture production, bioremediation (the use of cultivated natural bacteria which consume and breakdown toxic pollutants), studies on the effect of exploitation of fish stocks on population genetics, diagnostic tests for seafood safety, and the discovery of new industrial and biochemical products.

Mr. Chairman, thank you for giving me the opportunity to present NOAA's FY 1994 Budget Request. I will be happy to answer any questions the Committee may have.

Senator KERRY. Thank you very much, Dr. Baker. Let me begin by asking you, if I may, last December you sent us a reprogramming request for $50 million in the 1993 budget, and that was only partially approved by Congress. No subsequent request has been submitted. It is my understanding that, if we do not resolve this, you could have funds for the National Weather Service and the National Marine Fisheries Services exhausted before the end of this year. Is that accurate?

Dr. BAKER. It is my understanding that a reprogramming request is currently being put together. Maybe Mr. Moxam could tell us where that stands.

Senator KERRY. Is this reflective of the current status?

Dr. BAKER. Yes, sir.

Senator KERRY. What is the approximate amount still pending?

Mr. MOXAM. The amount is $23 million, and we are looking at some of the satellite funds as sources. It would address operational concerns in the National Marine Fisheries Service, the National Weather Service, and the National Ocean Service.

Senator KERRY. When you say it would affect those three services, those are the line offices that would run short?

Mr. MOXAM. Yes, sir.

Senator KERRY. But the recruitment of the $23 million will come from where? The Appropriations Committee, I gather, has suggested that the Commerce Department has to find that somewhere within the Commerce Department; is that accurate?

Mr. MOXAM. Yes, sir. That is accurate, and that is one of the sources being considered right now. There could be transfers from other agencies within the Department. As allowed under the Fiscal Year 1993 Appropriations Act, up to 5 percent can be transferred from other agencies. So, that would be one source.

Senator KERRY. Have you identified which agencies will take the hit or which programs?

Mr. MOXAM. I believe right now, what is pending is the Economic Development Administration and the National Institute of Standards and Technology. But as you can imagine, Mr. Chairman, this is a fluid situation and we are still looking at it.

Senator KERRY. Are they programmed to take a hit because their outlays are running behind or there are surpluses there, or are they taking a hit operationally?

Mr. MOXAM. I am not sure why they would be, Mr. Chairman. But we could get back, certainly, to you for the record on that one, sir.

[The information referred to follows:]

TRANSFER OF FUNDS FROM NIST AND EDA TO NOAA

A total of $2.0 million will be transferred from the NIST construction of research facilities appropriation to NOAA. These funds are not needed by NIST in FY 1993 since their use is restricted solely to the actual construction of facilities on the NIST campuses in Gaithersburg, MD, and Boulder, CO. No construction is planned at these two sites in 1993; therefore, there will be no negative programmatic impact on NIST's programs in 1993.

A total of $4.012 billion will be transferred from EDA's Economic Development Assistance Program to NOAA. After the transfer, EDA will have almost $404 million available for economic assistance development grants in 1993.

In both of these cases the Secretary of Commerce determined that continued operation of the National Weather Service was a higher priority than using the funds for the purposes that they were originally appropriated for.

Congress was informed of these transfers in a July 6, 1993, letter to the appropriate committee chairmen and ranking minority members from the Department of Commerce Acting Chief Financial Officer and Assistant Secretary for Administration pursuant to the guidelines established in the FY 1993 Department of Commerce Appropriations Act (Public Law 102–395) and the National Oceanic and Atmospheric Administration Authorization Act of 1992 (Public Law 102–567).

Senator KERRY. I think it would be helpful just to have an understanding of what is going to be impacted as a consequence and what you are thinking about.

Now, with respect to the shortfalls, how did they come about?

Mr. MOXAM. I will give you an example in the National Weather Service. In fiscal year 1993 we had requested a total increase, including adjustments to base, of approximately $60 million, and that was to maintain the operations of the Weather Service. In the appropriations process, we received $45 million, so there is a gap right there. Now, what I can say is that in the fiscal year 1994 budget the $20.8 million that we are asking for in NWS operations would alleviate that problem and we would have full operation in fiscal year 1994. That is the best example right there, Mr. Chairman.

Senator KERRY. Well, turning our attention to the issue raised by this investment package, where does that leave us with respect to possible supplementary requests or reprogramming?

Dr. BAKER. Well, the so-called investment package includes two parts of our budget. One is for Weather Service modernization and the other is the FCCSET programs on climate and global change and high performance computing and communications. As I understand it, that amounts to about $243 million above the caps. If, in fact, that money was not available we would have to go back and look at our overall priorities in our budget to see how we would be able to find those funds. We need those funds in order to maintain the Weather Service and do our other research.

Senator KERRY. I understand that, but as you break it down, you have got your next generation weather radars at $40 million, you have got weather office construction at $14 million. What office

construction is that? I thought we were busy trying to renovate existing offices.

Mr. MOXAM. Mr. Chairman, that is building the new weather forecast offices. They also are colocated with the next generation radars. We find that we have to, given the new restructured Weather Service, build new offices to house them.

Senator KERRY. How many of those are going to be built?

Mr. MOXAM. I believe we are going to have 115 offices under the restructured Weather Service. I understand it is about 80 or 85 would be brand new construction and then we have some rehab on the others and use of existing facilities on the others. I can provide a breakdown more accurately for the record, Mr. Chairman.

[The information referred to follows:]

Of the 116 weather forecast officer, the NWS will build 84 new facilities, lease 22 facilities, and modify 12 existing facilities. Existing weather offices were evaluated to determine whether modifications were possible. Special requirements needed to support the advanced technology of the modernized NWS and increased space requirements made most facilities unsuitable for modification.

Senator KERRY. Well, now, you are currently obviously under court challenge in trying to close some offices. New York and Boston, I guess, are among those under contention. Where does this construction leave those offices or those locations?

Mr. MOXAM. Mr. Chairman, if I recall—we probably should provide this for the record, but if I recall, that would not affect the construction schedule, sir.

Senator KERRY. I am not talking about schedule. Would they be one-for-one replacements? Would the office close in New York and a new office open, or will the Weather Service be gone from New York and gone from Boston? What does this new generation radar mean for either New York or Boston?

Dr. BAKER. Mr. Chairman, it would probably be good if we got the head of the Weather Service to answer that specific question for you, Joe Friday. Joe, would you come up to the table?

Dr. FRIDAY. Thank you, Mr. Chairman. With respect to the New York office, we are located at 30 Rockefeller Plaza at the present time, right in downtown Manhattan. The new radar simply cannot go on top of that building to replace the old radar. First of all, the company will not allow us to do it. And second, if we put the new radar in the middle of Manhattan, all we would get is the buildings and ground clutter, just as we do with the present radar that is there at the present time.

The location for that new radar is at Brookehaven Laboratory on Long Island, which covers all of the New York metropolitan area and extends into overlapping with the radars that are located in the Massachusetts area and over in New Jersey, and in upper New York.

The new office is constructed. As a matter of fact, the construction is essentially complete on Brookehaven Laboratory. The forecast operation will eventually be relocated there, to be colocated with the radar to operate fully, to cover the whole metropolitan New York area.

The same situation exists in Boston. We are located at the present time at Boston Logan Airport. There is no location at that point to place a radar. We will be placing the radar at Taunton,

MA, just a little bit south of the main Boston metropolitan area and will be relocating the office there at that point. That construction is also complete. The installation of those radars are immediate in order to provide that type of coverage.

Senator KERRY. Not that it has to be for any reason located there, but I am curious why you say that there is no location at Logan, just out of curiosity.

Dr. FRIDAY. Tower clearance. This radome is considerably larger than the existing radome. The tower height to clear the surrounding obstacles for the ground clutter and all of that sort of thing. The air traffic control situation at Boston Logan would simply not permit a 90-foot tower with a 35-foot radome on top of it.

Senator KERRY. OK. Now, what about the additional items in the investment packge here? You have got geostationary satellites at $66 million and change; polar satellites at $11 million plus, almost $12 million; the climate and global change research that you mentioned at $23 million. Now, none of that is currently within the caps; correct?

Dr. BAKER. That is correct.

Senator KERRY. So, in essence you are presenting us a budget at this point that is really out of whack. You know that there were different earlier expectations, and I understand that. But now you are presenting us a budget which really does not have the flexibility to address the current situation.

Dr. BAKER. The fiscal year 1994 budget was put together with a total number that was given to us. It was, as I understand it, OMB's decision to identify certain parts of that.

Senator KERRY. I think it is terrific they did it, Dr. Baker. I am not complaining about that, but it failed. I mean, it was great that they took out some stuff for an investment package. I was all for it. I voted for it. I think it is a shame we did not get it. And it is a damn good way to begin to move to a capital budget concept, which is what we ought to be doing around here.

But it did not happen, and now we are all stuck. I am looking to you for some guidance because we are going to have to come in here with a markup that must somehow find offsets if we do not already have them from you.

Now, as it currently is put to us, you have this $243 million pot sitting outside of the current budget that you have presented us, and I am trying to get a handle on where we go. What do you recommend taking from where in order to get at this, or is there some other solution that is being contemplated?

Dr. BAKER. This is a serious problem which we are looking at right now. In fact, we started about 2 months ago when the new appointees had the chance to start to understand what was happening in NOAA.

We started a strategic planning process and we have put together a draft strategic plan to look at our priorities in NOAA. And I think the first test of this plan is, in fact, going to be for us to try to find how we can find these numbers within the caps. And that is something that we are doing at present, something that we are taking very seriously.

We have to look at our overall strategic plan to see, in fact, how we can accommodate numbers that do not fit within the caps.

Senator KERRY. Let me ask you this question. Before we get to the point of decision here, is it your intention to come and visit with us and make some recommendations to us, or are you simply leaving this in our hands?

Dr. BAKER. No, sir. We have, in fact, provided your staff with our strategic plan, and we are having discussions now about that process.

Senator KERRY. But we do not have numbers yet, as I understand it?

Dr. BAKER. Not yet, no.

Senator KERRY. So, we really cannot proceed until we get a sense of that. Now, is it your sense, I mean have you had discussions with the Budget Director Panetta or anyone about trying to change the current cap mark?

Dr. BAKER. It is my understanding that the two NOAA items, the Weather Service modernization and the FCCSET climate and global change are high priority for the Office of Management and Budget, and they are trying to see if they find a way to fit these in the caps.

I do not know how far they have gone but, in fact, they have identified some items that they consider to be of high priority, and both of our items are in that high-priority list.

Senator KERRY. When you say both—I am looking at about six or seven different items here.

Dr. BAKER. Well, the one called Weather Service modernization, which includes MARDI, the Weather Service systems, the construction, satellites.

Senator KERRY. And training?

Dr. BAKER. Correct.

Senator KERRY. So, it is not broken down the way I have it.

Dr. BAKER. That is right. We have it broken down into two parts—$217 million for Weather Service modernization, and I think it was $25.6 million for climate and global change and high performance computing and communications.

Senator KERRY. OK, fair enough. Is it your sense that they are going to try to embrace that in its entirety?

Dr. BAKER. It is my sense that they understand the urgency and importance of the issue.

Senator KERRY. Do I have to interpret that? [Laughter.]

Dr. BAKER. I am hoping they understand it to the point that they will find the money for us. We have been working hard to try to make that point with them.

Senator KERRY. Can I ask you if, in conjunction with that, as we look at an investment package, would it not make sense to also make the case with them with respect to the fleet modernization?

Dr. BAKER. Well, they, I believe, are committed to supporting fleet modernization. I have discussed this with Alice Rivlin who, I believe, is very supportive. We, ourselves, are very supportive of fleet modernization. We see some very good opportunities in conversion of some of the DOD Navy ships which may be available. We are committed to this, and we think we can make some real progress on it.

Senator KERRY. Well, I have heard that before. I am not dumping responsibility for that one on you, but I have heard it before.

NOAA has a 22-ship fleet that is approaching 30 years of service. It is my understanding that only six of them have been partially rehabilitated. None of them have had a full mid-life rehab. From my own experience of only 4 years in the Navy, I can remember how often we were in the yard and how critical it was for the capacity of those ships to perform their functions.

It is also my understanding that the data processing equipment and electronics on these ships are just antiquated, and that work requirements now asked of these ships is twice what they are capable of performing.

I mean, if the fleet performance is at 50 percent mission or less, we are in trouble. Is that fair? Am I overly dramatizing the seriousness of the situation?

Dr. BAKER. I think that is an accurate statement of the situation.

Senator KERRY. It seems to me that if you are going to talk about ocean research, proper coastal protection, and fisheries science that is intelligent enough to help our fishermen feel like they are not being bludgeoned into decisions that they do not understand, the fleet performance is critical.

In my judgment, it is certainly more critical to manage and protect marine resources than have a supercollider or a space station. I realize that such choices are not necessarily your call. But if we are starting to make these tough choices, that call is not a very tough one for me.

Dr. BAKER. Well, we are fully committed to fleet modernization. We will be coming in in fiscal year 1995 with a strong statement and request in that direction. Our plan increases the number of ship days from the current 3,600 to 5,000. And as I say, we are looking very closely at the opportunities that are offered by the ships that are available from the Navy.

Senator KERRY. Well, I hope you can do that, and I would love to see—maybe we could have some kind of input shortly, because I plan to circulate a letter and send it to the President, to the Vice President who I know is concerned about NOAA's mission, and also to Leon Panetta with respect to the urgency of the NOAA budget situation. We are seeing this deteriorate on an annual basis, and I think you need some help from us, and I think it is my responsibility to try to draw their attention to it.

I do not know what good it can do in this year, but I think we ought to lay our marker as we come into the next cycle.

Dr. BAKER. That would be very helpful.

Senator KERRY. I will do that, but I would like to have from you a better understanding of any gap that could be filled by some of these Navy vessels so that we really have a better sense of what we need to rehab, and what we can replace, and what we can shore up at least temporarily.

Dr. BAKER. We will do that.

Senator KERRY. That will be very helpful. I have had a pretty decent first round, and I am joined by my colleague, Senator Lott. So, why do I not yield to him and then come back.

Senator LOTT. Thank you, Senator Kerry. I do have a few questions I would like to ask. Over the past 20 years as a Member of the House and a member of the Merchant Marine Fisheries Committee there, and now in the Senate, I have always had a particu-

lar interest in making sure that the ocean side of your agency did have proper consideration and adequate funds because I think the fisheries in particular, and oceanographic and all of that is very, very important. And I have always felt like it sometimes seemed to get kind of gobbled up by the dry side of the program, so to speak.

In this year's budget, NOAA received a net increase of $200 million, I believe. The bulk of that increase went to the National Weather Service and NESDIS, and while the Weather Service and NESDIS and the atmospheric programs under OAR received a net increase of over $250 million, NOS and the ocean programs under OAR were cut by almost $22 million.

Why does NOAA give the dry programs such a priority over the ocean and coastal management and research programs, which I think are very important to our country, and certainly important to my State and States like Massachusetts?

Dr. BAKER. Well, Senator, I cannot take full responsibility for previous NOAA budgets, but I share your concern about the oceans part of NOAA. And I think you will see in our strategic planning process that we began in the last couple of months and in our fiscal year 1995 budget an attempt to really look at that question and try to readdress that general issue of the wet side versus the dry side.

I think one has to recognize that there has been a commitment in NOAA to do the Weather Service modernization. And to the extent that that has skewed the budget some, we may be seeing those priorities. But as I say, I think you will find the new NOAA management is very much committed to redressing and emphasizing the ocean side.

Senator LOTT. Very good. Dr. Baker, the 1990 amendments to the Magnuson Fisheries Management and Conservation Act established new responsibilities for NMFS, including shrimp fishery by-catch reduction, highly migratory species management, as well as tuna labeling requirements. How are these responsibilities going to be addressed in the 1994 budget?

Dr. BAKER. If I could, Senator, could I get the Acting Director of the National Marine Fisheries Service to answer that question; Nancy Foster?

Senator LOTT. I am particularly interested in shrimp fisheries by-catch and the migratory species management, but I know others are interested in the tuna labeling requirements.

Dr. FOSTER. On the shrimp by-catch study, even though we did not get any additional funding for that, we have been proceeding with that study, working with industry, and hope to have something available by December of this year.

Senator LOTT. If I could ask you right there, if you should get some additional funds earmarked for the shrimp by-catch problem, what amount of money would be usable in the first year? And I see you have got your budget man sitting up there, smiling. But are you talking about a $2.5 million program? What are you talking about?

Dr. FOSTER. Do you mean the first year after we come out with the study? Do you mean in fiscal year 1995?

Senator LOTT. Well, let me maybe ask you to for the record get that information because I am working with others in the House

to look at what we could do to move that right along, because it is a severe problem we have got to deal with in the gulf and in other regions, and we cannot just keep shoving it off into the future.

[The information referred to follows:]

The issue of by-catch in the gulf shrimp fishery will be addressed using funds requested in the FY 1994 budget under the MARFIN and Sea Grant Programs. This is consistent with the funding approach to address this problem over the past several years. In addition, should funding be available under the S–K program in FY 1994, by-catch reduction projects for the gulf shrimp fishery will be given a high priority. We believe that these funding sources provide an adequate base from which this issue can be addressed.

Dr. FOSTER. That is correct.

Senator LOTT. Do you want to address the others?

Dr. FOSTER. Let us see, highly migratory?

Senator LOTT. Yes.

Dr. FOSTER. We have been playing catch up, you might say. Over the past year we have managed to find funding from existing programs to set up a highly migratory division in fisheries management. We have actually come out with—done some work on swordfish and bluefin tuna.

You know, we expect there will be some discussion this year, during Magnuson Act reauthorization hearings, as to whether or not the highly migratory responsibility should remain with us or whether or not it should be given to the councils.

But right now, we feel that we are in a position to actually do some good, make things happen.

Senator LOTT. Dr. Baker, I understand that NOAA proposes to eliminate 144 positions. Where are you going to eliminate those positions?

Dr. BAKER. That is a good question. I do not believe we have identified where we would do that.

Mr. MOXAM. That is correct. That was part of the 100,000 reduction in Federal employees. That was NOAA's share in fiscal year——

Senator LOTT. Well, I think that is a worthwhile goal. But I think also this committee, as an authorization committee with jurisdiction over NOAA, would be very interested in how you do that. And we want to make sure that it is done in what we would consider a fair way. And, of course, I will always be looking to see how if affects Fisheries and the wet programs, again.

Mr. MOXAM. Yes, sir.

Senator LOTT. One final question, I guess, for now, again, to you, Dr. Baker. What promise does marine biotechnology hold for enhancing the following areas: aquaculture, bioremediation, seafood product safety, pharmaceuticals, polymers, and lubricants?

Dr. BAKER. I would like to, if we could, provide an answer for the record. Because there are some very interesting things that biotechnology can do in all of those areas. Let me just say that, over the years, the work that has been done, supported by the Sea Grant Program, has, in fact, enabled us to show that you can do some of these things, like finding bacteria that can eat pollution, for example. And we believe this is a very exciting area, and we would like to see it supported. And we are pleased to see what has been supported in the past through Sea Grant.

[The information referred to follows:]

SEA GRANT BIOTECHNOLOGY

Biotechnology holds the promise of further enhancing aquaculture through production of cloned vaccines for animal diseases, development of disease-resistant strains with improved growth and food conversion characteristics, control of reproductive processes at a fundamental level, design, and demonstration of recirculating containment systems, and advancement of a range of science and technology needed to culture marine finfish especially. The marine aquacultural industry has the potential to employ tens of thousands of additional workers and reduce imbalance of trade of seafood by hundreds of millions of dollars.

Use of marine species in bioremediation is just beginning to develop, but already there are applications using them to detoxify organic pollutants such as petroleum and toxicants in industrial brines. Current efforts focus primarily on the isolation and culture of microorganisms capable of carrying out specific chemical transformations. The metabolic pathways that lead to these transformations can then be identified, the genetic basis determined, and the organisms cultured or genetically enhanced and used in bioreactors to detoxify pollutants.

Marine biotechnology has the potential of providing rapid assays for viral, bacterial, and chemical contaminants in seafood and thereby making implementation of hazard analysis and critical control point (HACCP) procedures in the seafood industry economic and reliable. For example, Sea Grant research developed a rapid enzyme-linked immunosorbent assay (ELISA) for the detection of Vibrio cholerae, the bacterium that causes cholera. A commercial firm has adapted this technology to produce a small handheld kit into which a dipstick, previously exposed to sample, can be inserted. A squeeze of the fingers exposes the sample to diagnostic reagents. Within 10 minutes a positive sample produces a solar reaction discernible to the naked eye. The company sent millions of these kits to South America where they are being used to combat an epidemic of cholera.

Marine biotechnology holds promise for advancing science and providing the technical basis for products, processes, and job creation in the pharmaceutical and chemical industries. For example, the natural products and biodegradable polymers you heard about from the presidents of OsteoArthritis Sciences, Inc. and Donlar Corp., respectively at the April 29 hearing on marine biotechnology have the potential to provide hundreds of millions of dollars annually of U.S. products to international markets and to employ hundreds of people.

Senator LOTT. Well, of course, all of these are very important, but I would be particularly interested in how it would affect aquaculture, seafood product safety and polymers, and any information you could provide for the record on that would be helpful.

Thank you, Mr. Chairman.

Senator KERRY. Thank you very much.

Let me just comment as I turn to Senator Dorgan. As I listen to your answers to the questions of Senator Lott and also my own, it leaps out at me that you have really been handed an extraordinary can of worms. I think it is important for us to acknowledge that. We have got to work together very quickly to see how we begin to redress the budget situation realistically, because we have watched the NOAA mission growing. Each year, your predecessors have sat there and said that they were working things out or that funding was going to be adequate, and it has really been kind of a shell game. You have now inherited a situation where, as you lift up the shells, you find that there is no pea anywhere.

Senator LOTT. Senator, if you would yield on that.

I think we have continued to give them more and more responsibility and more and more cans of worms. And without blaming any division of Government or any particular person, I do not think we have given them the funds to do the task we have assigned them.

Senator KERRY. Well, that is what we are talking about. But, on the other hand, we have been told each year, well, we have got a plan, for instance, for the fleet modernization. And yet, the plan has never really been adequate or realistic. I think we have got to do a better job this year of demanding a little reality and of trying to measure what we can and cannot accomplish.

There is an urgency to getting the administration to think about this, and some form of capital budget supplementary or something. The long-term investment, we all know, pays off in many, many ways. I have to leave at 10:30, to go to a HUD hearing, where we have an example of billions of dollars of property being held by Government. We will not invest a small amount in the process of selling it off and of managing it properly. And so, we wind up picking up billions of dollars of extra cost.

Here it is the same kind of thing. A little bit reversed, but if we were to invest properly in some of these programs, the return on our fishing catches, the return on the marine biotechnology, the return on other NOAA science programs could wind up saving us billions of dollars down the road or producing billions of dollars in revenues.

And somewhere along the way, I think we have responsibility for making some judgments about that.

Senator Dorgan, thank you. I apologize.

Senator DORGAN. Mr. Chairman, thank you very much.

I know almost nothing and care almost less than that about shrimp. I guess it is interesting to listen to the subject.

Senator LOTT. You like to eat them; do you not?

Senator DORGAN. I do, indeed. [Laughter.]

Let me ask you about another part of your business, and that is weather forecasting and NEXRAD. There is some controversy in our State about NEXRAD. I assume that, Dr. Baker, you are familiar with the proposals on using the NEXRAD radar system in our part of the country?

Dr. BAKER. Yes, sir.

Senator DORGAN. I want to ask you about that, because we have some folks up in northwestern North Dakota that are concerned about the actions of NOAA and where you are headed in that area—so let me pose a couple of questions to you.

I am told that NEXRAD radars will cover larger areas and will replace older radar sites. Because you can cover larger areas, you will have fewer installations. In North Dakota, they plan to install the NEXRAD radar in three locations, Deering, Mayville, and Bismarck, ND.

I used to fly light airplanes, and I come from western North Dakota, so I know a fair amount about that territory. Williston, ND, is in the northwest. It will be about 105 miles or so from the nearest NEXRAD radar site in Deering, on the east, and 140 miles from the nearest site on the west, at Glascow, MO.

I am also told that NEXRAD radar, at that range, about 100 miles away, has no capability for evaluating weather at 10,000 feet and below. We have a provision in Federal law to prevent degradation of current weather service. I am trying to understand how, with the current plans you have for these NEXRAD installations,

you will ever achieve the ability to maintain service in that area, some 17,000 square miles, up in northwestern North Dakota.

And I might mention that the 17,000 square miles in western North Dakota and eastern Montana which will be without coverage, is about twice the square miles of Delaware, Rhode Island, and Connecticut combined. So, it is not a small area. Because I have flown light planes up in that area, I know that weather fronts come in rather unpredictably and quickly. Not only pilots, but farmers and others, worry about weather patterns changing very quickly.

Can you describe for me how you will meet the statute's requirement to certify no degradation of service with the current plans for NEXRAD in North Dakota?

Dr. BAKER. Well, Senator, let me say that I share your concern, and that there will be more than just NEXRAD radars placed in these areas. For example, the Automated Surface Observing Systems. But let me, if I could, ask the Director of the Weather Service to address that question specifically.

Senator DORGAN. All right.

I might say the Automated Surface Centers have also been consolidated, as you are well aware, so there are fewer of those, as well, and certainly none in western North Dakota.

Dr. FRIDAY. With respect to the radar coverage, the Williston area is, as you indicate, approximately 100 miles away from the nearest NEXRAD radar. Our data from the tests that we have to date in 27 locations where we are currently operating NEXRAD—the most complete data is the data record from Oklahoma City; it is a fairly similar terrain; it is a little more active weather area than North Dakota—shows that our accuracy out to 100 to 125 miles is much better than the accuracy with the present radar, essentially, within 25 miles of the radar.

Now, that is what the data shows with the real forecasters and real weather, using the real radar. And I will be glad to come and brief you personally on that, and provide you with the complete data set on that test on that data.

Senator DORGAN. At all altitudes?

Dr. FRIDAY. At all altitudes.

We are looking at the actual weather warnings and forecasts. We are not looking at where the weather occurs, but we are looking at all weather warnings and forecasts. And the fact is that they indicate that they are superior all the way out to the 125-nautical-mile range of the doppler coverage.

With respect to the 10,000-foot elevation, that is indeed a concern that has been expressed by many people. The fortunate thing is that the severe weather, the thunderstorms and the tornadic activity, hail storms and the gust fronts, and the like occur from storms that penetrate well above the 10,000-foot level. And the NEXRAD provides us with very able coverage of those storms. And I will show you the data to support that. It is no longer a paper study.

We now have 2 years of experience with the radar operating at Norman. We have over a year experience with the radar operating here at Dulles Airport. And we have substantial experience now with 27 radars operating. So, we have good data to show now.

I am convinced, based on everything that I have seen to date, that there will be no problem when we have to come to the formal certification that there will be no degradation of services, sir.

Senator DORGAN. You are saying to me that based on the information from existing centers, the circle that is drawn up in the northeastern part of Montana and the northwestern part of North Dakota will not experience degraded service in your judgment?

Dr. FRIDAY. They will not experience degraded service in my judgment.

Senator DORGAN. You know, I would like to spend some time with you about that. I know the Automated Flight Surface Stations have been consolidated in North Dakota, and you can fly hundreds of miles without being near an Automated Flight Surface Station. And the notion is that there will be no degraded service; that observations from these consolidated stations will be as accurate as they were in the old days. Of course, that is nuts. It is not happening.

To the extent that you meet your obligation under law and also meet the obligation to the people in our region, that is fine. But I remain skeptical that the drive to centralize and the drive to consolidate has once again, as it has in so many other matters, left the rural areas out of the picture. There are not many people who live out there, but, as I said, it is 17,000 square miles, twice the size of the combined States of Delaware, Rhode Island, and Connecticut.

Whether it is a farm family out there wondering if a whiteout is going to happen in 4 or 5 hours, or whether it is a person flying a Cessna–172 wondering what kind of weather they are going to get into, I want to be certain that we are not creating conditions that are unsafe because we have consolidated and achieved some efficiencies, but are much less effective in forecasting in a rural area.

So, I raise the issue today simply to say I would like to go over it in some detail with you. As you know, there are other people who are well aware of the science that are skeptical of your contention that service will be maintained. And I would like very much to have them sit down with us and try to understand whether yours is blind faith or it is indeed grounded in good scientific research.

Dr. FRIDAY. When we approved the modernization plan, it was blind faith based on the best estimate that we had. We now have real data with real forecasters and real weather. And I would be delighted to show you that data and anyone that you wish to have with you at the time.

Senator DORGAN. OK. Oklahoma weather?

Dr. FRIDAY. Oklahoma weather.

And very shortly I will be able to show you Kansas, Nebraska, and Iowa weather.

Senator DORGAN. They do not even wear coats down there, you know. [Laughter.]

Well, I appreciate your information, but I very much want to get us together, along with some of the folks that are skeptical, and have us discuss this.

Dr. FRIDAY. Right.

Senator DORGAN. Because, ultimately, you are going to have to meet a test of nondegradation, and I and some others are going to make certain you meet that without question. And we do not want scientific uncertainty to linger, and people to say to us, "Just trust us, things will be just fine as soon as we get the bugs worked out of this new system."

So, Mr. Chairman, I will seek a separate meeting. Dr. Baker and staff, I appreciate the opportunity to proceed further on this issue.

Thank you.

Senator KERRY. Thank you very much, Senator Dorgan. I could not help but think as I heard your sizing of North Dakota—and I say this with due respect to Senator Pell and Senator Biden—but adding Rhode Island and Delaware does not do a lot to make it seem big. [Laughter.]

Senator DORGAN. But I might say for the chairman's edification, North Dakota is the size of 10 Massachusetts. [Laughter.]

Which puts it in somewhat greater perspective.

Senator KERRY. No, it is as big as Connecticut or a little bigger than Connecticut. We like that.

Senator STEVENS. And one-twentieth the size of Alaska. [Laughter.]

Senator KERRY. And, by the way, the price of shrimp is increasing up there.

Senator Stevens.

Senator STEVENS. Well, thank you very much. I am sorry I could not be here sooner. We had an OTA meeting that was very interesting. I look forward to telling Members about that.

Dr. Baker, I have a couple of questions, and I again want to say how sorry I was I could not stay at the other hearing you were at last week. These conflicts are getting too much for some of us. Let me ask you just an old fisherman's question first:

I understand you unveiled a hybrid pink-king Salmon recently, or someone in your agency. And it has raised a lot of questions from some of my friends up North. What is going to happen to the wild fish stocks if that hybrid gets loose in the Pacific? And what is it going to do to the size of the kings that we have in Alaska and Washington and in British Colombia if there is interbreeding as feared? And what is going to happen to their life cycle? Will we still have 4-year kings? Or will they be 2½-year kings because they are one-half pink and one-half king?

What is going to happen to our real joy of catching a real king, those of us who are fishermen, and really chase them, as I am going to do in July?

I was reading about that and it just dumbfounded me, you know. Are we serious about releasing a hybrid salmon in the Pacific?

Dr. BAKER. Let me ask the expert, Senator Stevens.

Nancy, are you familiar with that?

Senator STEVENS. I probably should wait for the next panel, they tell me, but I afraid that question might get away from me if I did not ask it right off.

Dr. FOSTER. Well, actually, this is the first I have heard of this hybrid. Where did you read it?

Senator KERRY. It is science fiction. [Laughter.]

Senator STEVENS. No, I would like to know that. Scientists from the National Marine Fishery Service unveiled a pink-king salmon hybrid, a fish with the fast growth rate of pink salmon and the large size of the king salmon. Actually, some of my friends were actually allowed to sample a taste of this new hybrid. It is called a transgenic fish, similar to the transgenic carp.

Now, you tell me who invented it. I do not know.

Dr. FOSTER. I recognize the name. But I will look into that.

As you know, we are very concerned about protection of the wild stocks. So, I will try to see what I can find out about that and let you know.

Senator STEVENS. I urge you to do it soon. The king salmon are on us and they are great this summer, and I am sure yours, Dr. Baker, in Washington are going to be after you the same way. Someone ought to tell us really what they are doing, and you know, science is science. If it is going to be of benefit to us it is one thing, but if it is another problem of the intersection of hatchery fish with wild fish, I think we are going to have a real battle.

Dr. Baker, what about the IFQ plan now? The administration has approved the North Pacific Fisheries Council proposal for halibut and sablefish. It is estimated to cost $5 million, we are told. It will run about $3.1 million a year.

There is not any money in the till, so to speak, and yet it has been approved. I have had some reservations about IFQ plans, but I know something has to happen. How is it going to be funded? Where are you going to get the money?

Dr. BAKER. Senator Stevens, it is my understanding that there was some carryover funds to start that process, 1992 carryover funds that would be available, about $570,000, and that this would allow at least some initial implementation of the program in late 1994. That would start the program, but it is not fully funded, as you pointed out.

Nancy, do you have any further comment on that?

Dr. FOSTER. No, that is correct. We have close to $600,000 in carryover that we have given to our Alaska region to do startup, and we are looking across the service now to identify people that might be willing to spend some time in Alaska and work with the regional office to get it off the ground. But you are correct. I mean, there is no identified pot of money to fund this.

I guess the critical thing is that the success or failure of IFQ programs depends on adequate implementation, so we are very conscious of the need to do this right in order for it to work.

Senator STEVENS. Well, there are a series of them coming along now, and our region is pioneering them, I guess, and I am all for us being pioneers, but I would hope that we would find a way to make certain this one works and that we can find a way to fund it without disturbing the overall NOAA budget before we go on to some of the massive plans that are coming along now.

We have got one coming, as I understand it, on crab, king crab. We have got another one coming on groundfish. When we get to that one, that one is going to be really expensive. If this one cost $3.1 million a year dealing with halibut and sablefish, the difference in the groundfish cost is going to be horrendous.

So, I would like to, you know, think that you could keep the committee informed about that. Some of us serve on both the authorization and appropriation side, and we would like to keep track of that.

One of the nagging questions is, after you get it started, Who is going to pay for it on an ongoing basis? Have you looked at that issue?

Dr. FOSTER. Yes. What we are planning to do with a portion of the carryover funds is to contract for a design of implementation, what it will actually cost for the monitoring of the takes for observer coverage, for enforcement, these kinds of things.

Senator STEVENS. We have had, in effect, limited entry concept in Alaska, and, you know, the permits are worth a lot of money but the enforcement is not there.

Dr. FOSTER. Correct.

Senator STEVENS. I wonder, if we are trying to find some way of creating a new piece of paper that is worth so much money, if there is not some way that that value can be used to pay for the program that created it. It is a matter—Mr. Chairman, I think we should plan to have some hearings. I would hope you would join me in coming up to God's country here this—maybe in August, and we will do a little marine research along with the research into how to pay for some of these.

We have great interest, as you know, in the Fisheries Obligation Guarantee Program, and Alaska producers are very serious about their interest because of the subsidized fish that is coming in from Chile and Norway, and enormous producers coming out of Russia.

I would like to know whether there is going to be a commitment that the guarantees will be fully utilized if this budget is approved. Mr. Hall, I think you have been involved in some of that, and Dr. Baker.

Dr. BAKER. Senator Stevens, let me just give you a quick answer for 1993.

We have been processing loan guarantee applications with a priority on refinancing existing loans and for providing funds for shoreside processors that are engaged in processing underutilized species. The program's authority to guarantee loans was expanded last year to include aquaculture, but at present no request for such guarantees has been made to the program.

We do not have any funds requested in 1994 for the Fishery Obligation Guarantee Fund. Given the fact that we simply did not have enough money in our system, it was a very tough budget year, and we had to make some tough budget decisions there.

Senator STEVENS. Well, you have the $47 million carryover, do you not, the money that was not utilized from the last cycle this budget asked us to carry forward in the next cycle?

Mr. MOXAM. Under the Federal Credit Reform Act, Senator, that money would not carry over into fiscal year 1994, as I understand it—the ability to make those guarantees, sir.

Senator STEVENS. Well, how about using it in 1993? You have still got some time to go.

Mr. MOXAM. We have some pending applications, as Dr. Baker mentioned, that we are looking at. I am not sure that it would be in that amount though, sir.

Senator STEVENS. Well, does the administration support the Fisheries Obligation Guarantee Program? I know there is no request for funding because of the lack of money this year, but is it to be discontinued?

Dr. BAKER. Let me check here to see about our official position on that. What is our position? We are not requesting funds, but what is our position on that?

Dr. FOSTER. We have been involved in some discussions in this whole area, fishery assistance; we have been exploring possibilities of using the FOG program in some way to—it would have to be modified, but in some way to help the fishing community through the tough times that are ahead.

Right now, it really does not serve that purpose, because in order to qualify for a guaranteed loan you have to be pretty well off. You have to be doing well. But we are looking at it in that context.

Senator STEVENS. Well, you have to be doing pretty well to compete with the Chileans and the Norwegians and the Russians, but if you do not get the money, you are not going to be able to compete with them long.

I understand we have got a series of applications in now for people to try and upgrade the total program to deal with this competition. I think—Mr. Hall, am I wrong? I thought we discussed this and you said you were going to obligate that money.

Mr. HALL. Yes, Senator, in 1993 we are going to obligate the full $47 million. There are applications in the pipeline at this point, and that will be done, and that is just an update that Andy might not be aware of, but—

Senator STEVENS. I would hope we would do it. We are going to be asked to put up some $3 billion to help the Russians with their economy, and across the straits from me that means that those fishermen are going to get grants from the United States, and my fishermen are asking for loans.

Mr. HALL. It is my understanding there are approximately nine applications in the process now, and that we are moving expeditiously on those applications.

Senator STEVENS. Thank you very much.

I have some other questions. I understand—well, I thought we were going to have a vote.

Senator LOTT. We were supposed to have a vote at 10:30 a.m.

Senator STEVENS. I will have some other questions later. I understand there is another panel coming.

Dr. Baker, again, my apologies for having to leave that last session. I understand you had a very interesting discussion with the chairman. I wish I could have stayed to participate with it, but I do look forward to working with you, and I am particularly really interested in this hybrid.

Also, could I ask you just this: I do not think we have ever seen a report, a full report from your people on the effect of the bioremediation programs we used and the other programs we used in the Prince William Sound after the *Valdez* disaster to see how effective they were from a scientific point of view. Let us just forget about the cause of the accident and everything, but how effective were some of these?

We had some 10 beaches that NOAA asked us to in some instances not to clean them, but all—in others to use soap and water, others to use hand massaging of the rocks, and others to use bioremediation, and I think the committee would be very interested sometime to have a report on what really happened. Was Mother Nature the best beach cleaner, or was it the bioremediation, or the Dawn dishwashing soap?

I really am serious, I would like to have that hearing, Mr. Chairman, if we could.

Thank you.

Senator LOTT. Just one question, if I could, Mr. Chairman, in addition to my question earlier. Perhaps Mr. Moxam, Dr. Foster, or Mr. Hall, one of you could answer this. We have had a dire need for the last several need for a facility and warehouse at your NMFS facility in Pascagoula, MS, which serves the lab and docks there, and there was language in last year's NOAA authorization and appropriations bill which required that. What is the status of that facility?

Mr. MOXAM. Senator, I believe that got put on the construction list. This is Pascagoula, I believe it is fixing up the warehouse down there, and, based upon the language we got, we moved it up in the priority, and I believe we are going to do it this year, but I would have to go back and check, sir.

Senator LOTT. I had some information that it perhaps would begin this quarter.

Mr. MOXAM. That would be right about on the schedule I have seen, sir.

Dr. FOSTER. That is correct.

Senator LOTT. Thank you very much, Mr. Chairman.

Senator KERRY. Thank you very much, Senator Lott.

I am informed the vote has been vitiated and there is a new amendment that is now being put forward, so we will not have a vote momentarily.

At any rate, I am going to leave momentarily, and Senator Stevens has consented to chair while I go over to the Banking Committee. I would like to ask one quick question before I leave, on increasing NOAA requirements for interdisciplinary research. At present, the agency has a fairly broad and diverse group of laboratories and regional facilities scattered throughout the various line offices that are doing research. I think specifically OAR has 11 labs, NMFS has 28 labs, and NOS has 13 labs.

The obvious question is whether a better integration of those NOAA facilities into a comprehensive network would minimize duplication and give us a little more bang for the dollar. I wonder what costsavings might be achieved from that, if you have gotten a handle on it yet. I do not know if you have had time to look at the issue.

Dr. BAKER. We are, Senator Kerry. One of the things we will be doing at the very beginning now is conducting a review of the science research that we are doing, in fact, to see if some better coordination or better organization would provide us with more efficient services.

I should say that many of the activities that our laboratories do are region-specific, and that is one reason that we have regional laboratories.

I should also say that in recent years we have seen some very good cooperation, for example with the fisheries oceanography activity that has gone on in Seattle between the fisheries lab and the Pacific Marine Environmental Lab, where we are looking at the environmental conditions on the Alaskan pollack, and so we have some very good examples of collaboration. But we are in fact conducting—just starting—a review of the science that we have to try to answer that question.

Senator KERRY. Fair enough. Well, again, I think that might be something that we want to try to get a sense of. I do not know how rapidly that could be done in the context of this budget.

If I could also ask Dr. Foster or Mr. Hall, what are we looking at now, as we go down the road here, for the New England groundfish fishery? Can you give me a sense of that?

Mr. HALL. Senator, as you know, the council is now meeting on amendment 5. They are working, and I think that is what will be the next big test of what happens in New England. We are working with the council to make some decisions that may be difficult, but will be absolutely necessary for the long-term good of this fishery.

As we go into that, some of the things that we are looking at are ways to deal with the whole problem, and not just deal with the management issues. We are exploring a number of options inside NMFS and in other parts of Commerce, and working with the economic development agencies in Commerce to deal with some of the problems that will be involved in that.

Senator KERRY. Well, we talked about that at the meeting that you and I had in my office. Picking up on Senator Stevens' concern that he expressed about the economics of fisheries in Alaska, this is going to be a universal problem.

We really need in short order to come up with some kind of proposal, notwithstanding other budget problems, that provides some help to these fishermen who we all want to have fishing 9 or 10 years from now, and catching more fish. There has to be some way to help them through the storm.

Mr. HALL. Senator, we are in the process of having a number of internal meetings at this point, and I think we would like an opportunity to meet with you and your staff to go over some of those ideas in the next few weeks.

Senator KERRY. I appreciate that very much. I look forward to working with you, and recognize that we have a very tough problem to try to work through.

We are anxious to try to help you. First, I think it is essential to get a handle on how we are going to deal with the investment package shortfall and begin to get a sense of how we arrive at a budget that works within the caps or changes the cap. I know you want to do that.

We will do the best we can. Senator Stevens who thankfully is also on the Appropriations Committee can and has been very helpful to us, so we will try to work together. I thank him for chairing for a moment.

Senator STEVENS [presiding]. I understand we are finished with this panel, and we will go to Dr. Burris and Mr. Helms and Mr. Silva.

Thank you very much, gentlemen. I look forward to working with you.

Senator KERRY. I might just add, a number of Members have asked to have the record left open so they could submit some questions in writing which we will do.

Senator STEVENS. Gentlemen, thank you very much. The chairman will be back, we believe, if he can get through the other committee. We have to wait in line to ask our questions as we come in late to these committees, but as soon as he can he will be back.

Meanwhile, we would be happy to have your statement, Dr. Burris. And if you gentlemen, Mr. Helms and Mr. Silva, have statements we would be pleased to have you present those too, and then I do have some questions. Thank you.

STATEMENT OF JOHN E. BURRIS, PH.D., DIRECTOR AND CHIEF EXECUTIVE OFFICER OF THE MARINE BIOLOGICAL LABORATORY, WOODS HOLE, MA

Dr. BURRIS. Thank you, Mr. Chairman and members of the committee, for the opportunity to testify today on the importance of marine biotechnology and the need for a stronger Federal role in this area.

My name is John Burris, and I am Director and Chief Executive Officer of the Marine Biological Laboratory in Woods Hole, MA, the oldest marine biological laboratory in the United States and one of the leading institutions in the field of marine biotechnology in the world. I speak both for myself and for the National Association of Marine Laboratories today.

Mr. Chairman, with your permission I would like to submit my written testimony for the record and provide the committee with an overview of marine biotechnology and its importance in my oral presentation.

Senator STEVENS. Your complete statement will be printed in full.

Dr. BURRIS. Thank you. An enormously diverse assemblage of species occupies the marine environment which covers approximately 70 percent of the Earth's surface. By studying these many organisms, we will learn a great deal that will lead to the development of a number of products and processes. Marine biotechnology is certain to be a key technology of the coming century.

Through marine biotechnology, one can expect to achieve a wide range of objectives that include promotion of economic growth and stimulation of new business opportunities, creation of new high-technology jobs for the 21st century, development of new environmental and biomedical technologies, and improvement of America's global economic competitiveness in an emerging growth industry in which the United States currently leads.

Areas where one can expect exciting applications include biomaterials, pharmaceuticals and diagnostics, aquaculture and seafood safety, bioremediation, and an increased understanding of the oceans.

My written testimony provides specific examples to illustrate advances or potential in these areas. In the remainder of my oral presentation I would like, though, to concentrate my remarks on the efforts outside the United States and what the United States needs to do to remain competitive.

Few people would argue against the vast potential of marine biotechnology. The opportunities that exist, though, will not be realized if the field continues to be so woefully underfunded in the United States.

For example, biotechnology is by far the largest interagency initiative in the Federal Coordinating Council for Science, Engineering, and Technology process at more than $4 billion in the President's budget request for fiscal year 1994. However, marine biotechnology is a neglected stepchild in this process. Only about 1 percent of this initiative is for marine biotechnology research at universities and public research centers where the greatest advances are being made.

Total funding has been virtually flat since 1988. The lack of attention in the United States stands in sharp contrast with the high level of interest being shown in other countries. Japan, in particular, has embarked on a forward looking investment strategy in which industry and government have agreed to provide nearly $200 million for marine biotechnology in a decade-long program under the auspices of the Ministry of International Trade and Industry, MITI. It is this commitment that serves as a particular example of why we need to increase considerably U.S. efforts.

I received in the mail several weeks ago a 130-page report from the Marine Biotechnology Institute, the public-private enterprise initiated by MITI that I have alluded to. This institute includes two centers that have been built and equipped with an approximate startup cost of $50 million. Each center includes a 50,000-square-foot building that is filled with the most advanced equipment. The institute also has a 3,200-ton research vessel.

Sixty scientists are working at the institute, most on loan from the 24 investing companies in the institute. And who are these investing companies? They include familiar names like Asahi, Fujitsu, Kawasaki, Kirin, Shisheido, and Suntory. The annual budget—over $20 million to tackle projects that include discovering chemicals from marine organisms to bioremediation.

In addition to this one focused initiative, it is estimated that Japan spends between $900 million and $1 billion per year in marine biotechnology. We are seeing similarly strong commitments throughout the Pacific Rim, many of which are based on technologies pioneered in the United States. While the United States is currently a world leader in marine biotechnology we will not retain this lead for long if we fail to respond to the competitive challenge we face. The United States simply cannot expect to survive in the global economy if we consistently allow foreign competitors to capitalize on technologies that the U.S. taxpayer has funded.

It is essential to promote mechanisms for technology transfer, together with partnerships between industry, academia, and the Government to enable U.S. firms to bring products to the marketplace that are made possible through marine biotechnology.

I believe that legislation such as the Marine Biotechnology Investment Act fulfills this objective and more. Such legislation will establish a broad-based program within Sea Grant together with a process to ensure that proposals are funded on the basis of scientific merit. It builds upon Sea Grant's record of commitment to marine biotechnology. It fosters the public-private partnerships that are needed to produce the products that will create jobs and economic growth, and it supports the training and education that we need to ensure that we have the human resources that are required.

Most importantly, such legislation authorizes a significant increase in funding that represents a very substantial improvement in the U.S. commitment to this exciting field.

Mr. Chairman, I want to commend you for holding this hearing and for playing a leadership role in bringing much needed attention to the enormous potential of marine biotechnology. I would urge quick passage of new legislation to improve U.S. capabilities in this field.

Again, thank you for inviting me to testify today, and I would be pleased to respond to any questions that you or other members of the committee may have.

[The prepared statement of Dr. Burris follows:]

PREPARED STATEMENT OF DR. JOHN E. BURRIS

Thank you, Mr. Chairman and members of the Committee, for the opportunity to testify today on the importance of marine biotechnology and the need for a stronger Federal role in this area. My name is John Burris, and I am Director and Chief Executive Officer of the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts, the oldest marine biological laboratory in the United States, and one of the leading institutions in the field of marine biotechnology in the world today. I speak both for myself and for the National Association of Marine Laboratories.

Mr. Chairman, with your permission I would like to submit my written testimony for the record, and provide the Committee with an overview of marine biotechnology and its importance to society in my oral presentation.

An enormously diverse assemblage of species occupies the marine environment which covers approximately 70 percent of the earth's surface. By studying these many organisms we will learn a great deal that will lead to the development of a number of products and processes. Marine biotechnology, the application of our understanding of the biology of marine organisms, is certain to be a key technology of the coming century.

Through marine biotechnology one can expect to achieve a wide range of objectives that includes:

- promotion of economic growth and stimulation of new business opportunities;
- creation of new, high-tech jobs for the 21st century;
- development of new environmental and biomedical technologies;
- improvement of America's global economic competitiveness in an emerging growth industry in which the United States currently leads.

Marine biotechnology offers a broad range of applications that will revolutionize our ability to better use marine resources and lead to the above objectives. I would like to highlight a few of these promising applications:

Biomaterials: A wide variety of compounds are already extracted from marine organisms, and many more are being sought. The best known of these are biopolymers such as agar, algin, and carrageenan that are extracted by traditional methods from marine algae and are used in applications as diverse as food stabilizers, capsules for drugs, and coating for paper. As we learn more about the algae and are better able to extract compounds or genetically manipulate the algae to produce more or different biomaterials, one can expect even more biopolymers to emerge as useful products. Another polymer, this time from the foot of the common blue mussel, is an adhesive protein that may be used to repair knee ligaments or in dental cavities and skin grafts. There are also many enzymes found in marine organisms that will have applications. Already the high temperature stable enzymes isolated from bac-

teria found in deep sea vents have been commercialized for use in laboratories and may be used in other high temperature applications, such as laundry detergents.

Pharmaceuticals and diagnostics: Considerable effort is being directed to searching for pharmaceuticals from the marine environment. Encouraging results in this area include an analgesic and antiinflammatory agent isolated from a marine sponge, an anticancer drug from a sea squirt, didemnin B, that is now in clinical trials, and a new class of antibiotics, the aplasmomycins, that are active against bacteria and the causative agent of malaria. Diagnostics continue to be sought, with one of the most successful marine biotechnological products being the extract from the blood of the horseshoe crab (Limulus) that is used as a test for endotoxin.

Aquaculture and Seafood Safety: With a 1989 trade deficit of $4.9 billion in fisheries products in the United States, it is clear that a market exists for seafood products that our producers are unable to meet. Enhancement of marine aquaculture using biotechnology is one way to help meet some of that demand. For example, the use of growth hormone with freshwater fish has led to remarkable increases in their growth rates. The breeding of a triploid strain of oysters now allows year-round oyster production, rather than just seasonal production. The development of new vaccines against fish and shellfish diseases will enable greater cultivation of commercially important species. As Americans continue to eat progressively more seafood each year (one estimate by the Department of Commerce projects that U.S. seafood consumption could grow 40 percent by the year 2000), the safety of that seafood will be of paramount concern to the public. Marine biotechnology offers sophisticated tests that will enable assays for ciguatoxin, a poison, in fish and Vibrio cholerae, the causative agent of cholera, in oysters. Others are in development to enable us to test for contaminated products and to learn more about the levels of toxins and how they enter the organisms.

Bioremediation: Improved methods to cleanup the marine environment following oil spills and the discharge of industrial and domestic wastes is another important application of marine biotechnology. The systematic screening of naturally occurring microorganisms or the enhancement of desired traits through genetic manipulation of the microorganisms hold great promise for environmental cleanup by the organisms, rather than through chemical means. Most prominently featured has been the effort to develop "super bugs" that attack and breakdown oil, but bacteria are also able to remove toxic metals and metabolize other industrial wastes.

Understanding of the Oceans: The products of biotechnology have significant commercial applications. They will also be important as scientific tools that will enable us to learn more about marine life and the ocean environment. Genetic probes that allow us to track specific populations of organisms, such as salmon stocks, can tell us a great deal about the movement and origin of the organisms and the waters in which they are found. We will be able, through increased understanding of the biology of microorganisms, to learn more about the cycling and consumption of many important elements and compounds including carbon dioxide, nitrogen, and phosphorus.

Few people would argue against the vast potential of marine biotechnology. The opportunities that exist though will not be realized if the field continues to be so woefully underfunded.

For example, biotechnology is by far the largest interagency initiative in the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) process, at more than $4 billion in the President's budget request for FY 1994. However, marine biotechnology is a neglected stepchild in this process. Only about 1 percent of this initiative is for marine biotechnology research at universities and public research centers, where the greatest advances are being made. Total funding for marine biotechnology has been virtually flat since 1988.

The lack of attention in the U.S. also stands in sharp contrast to the high level of interest being shown in other countries. Japan in particular has embarked on a forward-looking investment strategy in which industry and government have agreed to provide nearly $200 million for marine biotechnology in a decade-long program under the auspices of the Ministry of International Trade and Industry (MITI). In addition to this focused initiative, it is estimated that Japan spends between $900 million and $1 billion per year in marine biotechnology. We are seeing similarly strong commitments throughout the Pacific Rim, many of which are based on technologies pioneered in the U.S.

While the U.S. is currently the world leader in marine biotechnology, we will not retain this lead for long if we fail to respond to the competitive challenge we face. The U.S. simply cannot expect to survive in the global economy if we consistently allow foreign competitors to capitalize on technologies that the U.S. taxpayer has funded. It is essential to promote mechanisms for technology transfer together with partnerships between industry, academia, and the government to enable U.S. firms

to bring products to the marketplace that are made possible through marine biotechnology.

I believe that legislation such as the Marine Biotechnology Investment Act fulfills this objective, and more. Such legislation establishes a broad-based program within Sea Grant, together with a process to ensure that proposals are funded on the basis of scientific merit. It builds upon Sea Grant's record of commitment to marine biotechnology. It fosters the public-private partnerships that are needed to produce the products that will create jobs and economic growth. And it supports the training and education that will be needed to ensure that we have the human resources that are required.

Most importantly, such legislation authorizes a significant increase in funding for marine biotechnology that represents a very substantial improvement in the U.S. commitment to this exciting field.

Mr. Chairman, I want to commend you for holding this hearing, and for playing a leadership role in bringing much-needed attention to the enormous potential of marine biotechnology. I would urge quick passage of new legislation to improve U.S. capabilities in marine biotechnology.

Again, thank you for inviting me to testify today, and I would be pleased to respond to any questions that you or other members of the subcommittee may have.

Senator STEVENS. Mr. Helms, Senator Hollings expressed his regret that a conflict prevents him from being here today. Do you or Mr. Silva have any statement to make, and would you proceed please, Mr. Helms?

STATEMENT OF BENNETT HELMS, CHIEF EXECUTIVE OFFICER, ATLANTIC LITTLE NECK CLAM FARMS, INC.

Mr. HELMS. Thank you, Mr. Chairman. I am here in support of the marine biotechnology investment. My name is Bennett Helms. I am CEO of Atlantic Little Neck Clam Farms. The clam farm is located in South Carolina near Charleston, and it is the largest clam farm in North America. So, we approach the business of aquaculture seriously and have an investment of around $10 million in our operation.

My background is business, not marine biology. I have 30 years in other types of business, but 5 years ago I decided to step into the aquacultural industry. So, I bring primarily business experience to you today.

I was asked to speak on application and business opportunities, assessment of current existing Federal research and technical transfer, and any suggestions that I might have. So, I will try to run through those quickly.

The application of business opportunities for this type of program would result in safer seafood, particular shellfish which would be resistant to disease and food-born illnesses for humans. It would provide longer shelf life, increased value to the clam producer, the restaurant, and to the consumer. These programs could lead to a better tasting clam and other seafoods, so let us not forget that in our deliberations.

It would result in more resistance to temperature swings and salinity swings, which is very important in any aquaculture program. And I would add that it is those types of swings that, if we could develop shellfish or any seafood that could tolerate that, we can grow more types of species and grow them better in the United States versus other parts of the world and, of course, higher survival rates means more production and less production costs.

All of this adds up to being able to grow more species in the United States and a better product. The good news about aqua-

culture is that it is labor intensive. It provides jobs for the skilled and unskilled. The bad news is the production costs because of this labor intensiveness. So, the solution is leading technology. It is very difficult for us to compete with labor costs in all parts of the world, but we can compete if we have the leading technology.

The private sector can provide animal husbandry, production, and marketing, but it cannot provide R&D biotechnology. There are no sources of funds for this to be done by private industry. Banks would not lend the money, venture capitalists would not invest the money, and corporate earnings could not support it. So, either the Government steps forward or it will not get done. Compare this with the Japanese spending $100 million plus per year on the same subject.

Let me comment on the assessment of current existing Federal research transfer, from which we have benefited through the South Caroline Marine Resources Department and the Sea Grant Consortium. A direct application which we are using is brood stock maintenance, which is the first building block of aquaculture.

Spawning every Tuesday morning, we invite you down to watch us spawn 200 million clams. The local TV station did a segment on it and they called it "group sex," which set back the field of biology 2 or 3 years, but we spawned 200 million that day also. And our hatchery and post set, which is the first month of life, is in a highly controlled environment. And these conditions and protocol were developed by Marine Resources and with funds through Sea Grant.

The nursery production which is 1 to 4 months a clam's life, product control, laboratory protocols and data, and identifying critical variables, all the things which make our operation work, and all of these things were the reasons we went into business because they existed through these types of programs. And so without all of this available to us we absolutely would not be 82 people strong, fully operational, and on the way to 300 associates in our company by 1996.

On suggestions to strengthen, I would suggest that you be sure to include the link between the scientific and academic community and the producers. Sea Grant has played this role and has played it well. Without this link, 50 to 80 percent of the R&D may be interesting but of doubtful economic value.

Economic value means job creation, environmentally concerned businesses, a career for both unskilled and skilled individuals from OJT to Ph.D., and a real opportunity to reduce imports and increase exports.

So, thank you for hearing me out and I will be glad to answer any questions.

Senator STEVENS. Thank you very much, Mr. Helms. Let me go to Mr. Silva.

STATEMENT OF MARK SILVA, RESEARCH DIRECTOR, AMERICAN PROTEINS, SANDWICH, MA

Mr. SILVA. Thank you, Senator. The American Proteins business is in the protein recycling business in the poultry industry. We are actively engaged in marine technology, biotechnology, research programs particularly in omega oils or fish oils. We are actively engaged in fishing internationally. We have four plants in Peru. We

have one in the Atlantic, and we had to close one unfortunately down in the gulf. The company is privately held and all my research is funded by the Bagwell family of Georgia. I just happen to live in Massachusetts.

I would like to thank NOAA in appreciation for their support of the Charleston Laboratories biomedical test material programs which was one of the first efforts to purify these omega oils.

There was a conference in 1985 that was sponsored by National Institutes of Health, National Marine Fisheries Service, and the NFI on the health effects of fish oils. It was instrumental in beginning to bring to fruition a lot of the research on the antitumor effects which we have tried to support, and I could give you some information. I did not have the data prepared for this testimony, but I will submit information on the great progress in anticancer work that is being done in Europe.

The FDA GRAS status for marine fish oils is still held up, however there is a lot of new information on the ill effect of transfatty acids such as you find in margarine, and we hope that this will propel the FDA to hurry this status along.

This is one gram of 95 percent pure EPA–DHA, and its current cost is $100 a gram. If we had the money for support to start a pilot plant, we could probably lower the costs significantly.

There are a number of people who cannot testify here today who have done amazing research in this area. Dr. Pam Hargis unfortunately passed away at a young age, from Texas. She was the first to put these omega oils into poultry. That is my overall corporate goal. My overall goal is to try to incorporate the benefits of eating fish into a diet of children who are far less fortunate than a number of us sitting in this room today; try to broaden the base in which people can incorporate these oils into their nutritional status, and also to further the research into the medical applications of these very unique oils.

To do that, the bottom line is we have to find fish, and there are ways in which I think NOAA could help us, one of which is the LIDAR program. Right now there is no office within NOAA which coordinates the either laser based or space satellite based research into fish biomass or plankton or any of these other subjects. There are other countries that are leading in this area.

It is kind of ironic that the Army Corps of Engineers has had to go to a Canadian company to take technology which was essentially developed in the United States within the Navy and the Department of Defense and put it to supporting these efforts.

Right now, the best fish finding laser in the world is owned by the Army. I think there was a great cartoon in the National Fisherman, and I think it addresses a lot of your constituents, where there was a picture of a boat and on one side a fisherman was leaning over and he was seeing a great school of fish, and on the other side there was a NOAA observer and he only saw one fish. And he said, I think this is grounds for a closure right now.

I think as a scientist, one of the things we want is to try to get a good scientific basis for making any type of management decision. And I think that having a fleet ourselves, the usefulness of fleets, given what you can accomplish from space, what you can accomplish from platforms on which LIDAR's and other color scanners

are positioned is much greater on that side. And I think equal balance should be given rather than putting all the chips into a fleet modernization program.

The areas such as bioremediation you mentioned, we did some work in that area. It is very, very difficult to get through the agencies. There is no one to really foster the business community's attempts to try to get some of these products done.

I can only hope that these issues be allotted more time for further study, and that the budget in marine biotechnology is increased significantly because we are exporting jobs and we are losing jobs. Foreign companies and foreign businesses are putting a lot, much, much more money into it than we are in the United States, and I think they will reap the benefits of this.

Senator STEVENS. Thank you very much.

I had lunch with Dr. Costelli. And it is very interesting the work he is doing at the Framingham Heart Institutes. I am sure you must know him up that way.

Dr. Burris, I know Woods Hole is involved deeply into the examination of some of the problems related to the disposal of nuclear waste at sea. Were you part of that group that had the meeting just about a week ago and issued a white paper on that subject?

Dr. BURRIS. No, I was not, sir.

To make a distinction, there is an Oceanographic Institution and a Marine Biological Laboratory. And I believe that was at the Oceanographic Institution, which is up the street from me.

Senator STEVENS. All right.

I see our colleague, Senator Pell.

Senator, have you come to present a paper or to ask questions, may I inquire?

Senator PELL. To present remarks on the Sea Grant Program.

Senator STEVENS. Would you like to join me at the table here and do that? I do not know whether the chairman is going to be back, Senator Kerry, to ask questions of this panel. But why do you not sit at the table. If you gentlemen would just allow us to have Senator Pell make his presentation, I will get back to you with some questions.

Is that all right with you?

Please, Senator Pell.

STATEMENT OF HON. CLAIBORNE PELL, U.S. SENATOR FROM RHODE ISLAND

Senator PELL. Thank you very, very much, indeed, for affording me this opportunity. And I am grateful to the Commerce Committee for the interest they have shown in the Sea Grant College Program over the many years.

I am delighted to be with you this morning to speak in support of legislation, which I hope to join in introducing soon in the Senate, which will promote marine biotechnology through the National Sea Grant College Program.

I want to commend you, Senator Kerry, for your leadership in holding these hearings. I look forward to working with you and Senator Hollings to maintain U.S. leadership in this important field.

Our legislation, which represents an extraordinary opportunity for the United States to capitalize on an emerging growth field in which its leadership is being challenged by determined international competition.

Marine biotechnology, which uses molecular and cellular techniques to develop new products from marine organisms, has shown the ability to create new materials, improved aquaculture, and seafood products, better techniques for environmental remediation, and new pharmaceuticals from the sea.

This field has the proven capacity not only to revolutionize our use of marine resources, but also to improve our ability to manage those resources, which are becoming increasingly scarce.

We cannot afford to lose yet another promising new technology to our international competitors, whose governments are subsidizing efforts to bring to market the advances in marine biotechnology pioneered in the United States.

It is particularly appropriate that our marine biotechnology initiative be established in the National Sea Grant College Program.

As you know, Mr. Chairman, I introduced the Sea Grant Act in 1966, and this small program has amassed an extraordinary record of scientific accomplishment and economic benefit over more than two decades.

I know of few programs anywhere that have the demonstrated economic impact of the Sea Grant Program—a proven return of more than 20 times the amount of the Federal investment, despite declining resources over more than a decade.

In addition, because Sea Grant is a matching funds program, it is also a highly leveraged Federal investment in which nearly one-half of the total program cost is derived from State and local governments, university funds, and support from private citizens.

Sea Grant has the necessary balance of applied science to stimulate new advancements in marine biotechnology, education programs to train the skilled workforce that is needed, and outreach through the Sea Grant Marine Advisory Service to transfer promising new technologies to the private sector.

The single largest interagency research effort underway in the United States today is in the field of biotechnology, at well over $4 billion per year. Yet only 1 percent of this amount is available for research in the promising new field of marine biotechnology, and that amount has remained flat for the past 3 years.

We need legislation for the field of marine biotechnology to help promote and keep up with the explosive growth that has occurred in biotechnology in general. Marine biotechnology represents the kind of high-wage, high-technology, and high-skill initiative that is needed to revitalize the U.S. economy, while creating new jobs nationwide.

We need to respond to the priorities of the new administration in developing new partnerships between industry and Government, and preparing our economy to compete in the 21st century.

Our marine biotechnology initiative would establish within the Sea Grant Program encourages investigators throughout the United States to compete for funding, and ensures fair and open competition through a national panel of expert reviewers.

Our legislation will use the many existing benefits of the Sea Grant Program, and will not require the creation of new administrative mechanisms to support further advancements in marine biotechnology.

Sea Grant has led the U.S. effort in marine biotechnology, and has both the experience and the infrastructure to foster the growth of this field as quickly as possible.

I believe that the legislative concept being considered by this committee is precisely what is needed to ensure that the United States remains at the forefront of this promising new frontier.

Thank you for this opportunity to offer my views. I look forward to cooperating with you, Mr. Chairman, and other members of this committee to assist in its passage at the earliest possible opportunity.

I would just add that what the Sea Grant Program really is, is applied research, only applied research, and how to convert theoretical knowledge into dollars and jobs.

Senator STEVENS. Well, thank you very much, Senator.

My colleague in the House, Congressman Young, has joined Congressman Studds in introducing a bill over there, and has indicated they would like to have one introduced here. I intend to do that. And I understand Senator Kerry may wish to join. We would be happy to have you join in that effort if you would like to do so.

Senator PELL. I would like to very much.

Senator STEVENS. Thank you very much. I appreciate your courtesy in coming and presenting your statement today.

Senator PELL. Thank you very much.

Senator STEVENS. Thank you.

Mr. Helms, if I might ask you, in terms of your expansion, do you seek assistance in expansion or strictly in the marine biotechnology area, as far as your operations are concerned?

Mr. HELMS. Well, we would seek assistance in new products, which would be part of our expansion, such as oysters. And we would also seek continued assistance in the development of technology which would increase shelf life, allow for greater swings in temperature and salinity—all of the problems which any marine aquaculturist faces from a production standpoint.

Senator STEVENS. And have you reviewed that marine biotechnology investment act that Dr. Burris looked at?

Mr. HELMS. To a certain extent. I understand more than I have studied it.

Senator STEVENS. Good. Well, we appreciate having you here.

Senator Pell, Dr. Burris is the Director and Chief Executive Officer of the Marine Biological Laboratory at Woods Hole, and Mr. Bennett Helms is the chief executive officer of the Atlantic Little Neck Clam Farms, and a constituent of Senator Hollings from South Carolina. And Mr. Mark Silva is the research director of American Proteins, which is located in Massachusetts, but funded out of Georgia; right?

Mr. SILVA. No, sir. American Proteins corporate is in Georgia. I just live in Massachusetts.

Senator STEVENS. Oh, it is in Georgia.

Mr. SILVA. To be close to the Pell Library. [Laughter.]

Senator STEVENS. All right. If you have any questions of these gentlemen, be our guest, Senator.

Senator PELL. I do not think I will jump in. Woods Hole is a neighbor of Rhode Island. We have many connections there and are familiar with what they are doing. Anything we can do to convert theoretical knowledge, particularly in the field of proteins, into actual results is what we are after.

But I have no questions.

Thank you.

Senator STEVENS. The only trouble with Woods Hole is it is not in Alaska. We could use two of them up there.

Have you got any results yet from the bioremediation studies that have been made, Dr. Burris?

Dr. BURRIS. In my previous life down the street at the National Academy of Sciences where I worked before going to the Marine Biological Laboratory we heard testimony about a year and a half ago from EPA officials on the results. And they have been the ones who have done most of the comparison of scrubbing versus bacteria. And at that time they were very much preliminary. And I have not seen much since then.

I am not sure that the experiments were as well controlled as one might like. But I would suggest that you check with the EPA and see where they stand relative to that set of results.

Senator STEVENS. Yes, I think we shall do that. I just wondered if you had done any independent studies at Woods Hole of the whole concept of bioremediation.

Dr. BURRIS. Yes, one of the problems or the situations is, of course, that there have been studies done in various places, but they have not been as transferable as one might wish. In Texas, they developed a strain of bacteria that can consume oil, and then they rush it up to Prince Edward Sound and the temperature is perhaps 20 degrees lower than they are used to. And so that has been a real problem in bioremediation up to this point and one that we have to address, which is the ability of the bacteria to survive in different environments and compete both with the native bacteria, as well as the different nutrients, et cetera.

Senator STEVENS. Thank you very much, gentlemen.

Oh, I asked a question before of Dr. Baker about my king-pink salmon.

Dr. BURRIS. Your king-pink salmon?

Senator STEVENS. Are any of you involved in that?

Dr. BURRIS. No, we are not. I can respond a little bit because you alluded to transgenic carp, which I know more about. I do not know about the king-pink hybrid.

Senator STEVENS. Did they have an intersection with wild carp?

Dr. BURRIS. No, because they have been very carefully controlled and there has been no release, and there is no intent to release them, to the best of my knowledge. There has been research done where growth hormones have been placed in the carp as an experimental organism to study growth and impact. But they have not been released. They are held under very tightly controlled conditions, with multiple ponds to take care of any overflow, wire fences with barbed wire, et cetera, et cetera. So, it has been very carefully controlled.

You know, using carp to start out with, raises flags of concern, given the public's concern with carp.

Senator STEVENS. You do not put king salmon in pens and you do not put moose in zoos. I do not know if you know that. You cannot keep them in pens and you cannot keep moose in zoos.

We wonder very out loud about these hybrids and what they might do to our wild fish. Do you have any studies that would indicate what would happen if there was an intersection of a hybrid species with the wild fish?

Dr. BURRIS. Well, it depends if the hybrids are sterile or not. You see, many of the hybrids are sterile. And so it is unlikely, of course, that they would breed if they are sterile. I do not have the information on the particular hybrid you are talking about to know whether or not it is a sterile hybrid. If it is a sterile hybrid, then, of course, chances are——

Senator STEVENS. Well, we had a sterile hybrid of the pink, which was the pan-sized salmon that was pen raised. And so far as I know, there was no real problem about that. But there is such an overabundance of natural wild pinks that that really did not catch on. And we gave away 40 tons of pinks last year from State because they could not even get up the rivers to spawn. We really have an overproduction of pinks in Alaska.

The idea of the pink-kings, I think, is to reduce the size of the kings. That worries us a great deal. And, as I say, we worry out loud about that. But, our king salmon run, now that we have gotten rid of the driftnets—I see the chairman is back, but I will make my last comment—our limit on the Cook Inlet this year was to be one king salmon per fisherman. We were successful in removing the driftnets from the world's ocean, I think thanks to a great extent to the work of this committee, and all of them were taken down by December 31 of last year.

The king salmon run that came into Cook Inlet this year has been so great that with an overwhelming escapement, enough going upstream to assure absolute full maximum reproduction, all limits were taken off the king salmon in Cook Inlet this year.

The individual fishermen were allowed to catch as many as they could catch because there was such great abundance. Which means that we have to be very, very militant about our position with regard to devices such as the driftnet. We were successful in limiting the driftnet. I am certain there will be another device invented by a man that will be equally harmful to our fish if we are not vigilant.

But that is a real, real interesting thing. It only took 1 year to come back. Those nets were intercepting so many of our fish that we have maximum availability in the first year of the elimination of the driftnets. So, I thank you, gentlemen. I see the chairman is back.

Mr. HELMS. Senator Stevens.

Senator STEVENS. Yes, sir.

Mr. HELMS. May I make one last statement?

Senator STEVENS. Yes, sir.

Mr. HELMS. If you do have your hearing in Alaska in August and you need additional testimony, I will be glad to volunteer. [Laughter.]

It is a great part of the world.

Senator STEVENS. Well, I think we will talk to you about that, because I have asked the chairman here and the chairman of our full committee to come join me in that marine research. And I am sure Senator Hollings could use some consultation from an expert. [Laughter.]

Senator STEVENS. Thank you very much, gentlemen.

Senator KERRY [presiding]. Senator Stevens, thank you very much for taking over and covering for me. I appreciate it enormously.

Senator Pell, have you had an opportunity to make a statement?

Senator PELL. I have had an opportunity to make my statement, and I appreciate the hospitality of the committee very much, indeed.

Senator KERRY. Gentlemen, I am not going to go back into all of the areas that were covered. I gather from staff that you followed your written testimony pretty well. In discussing the need for a partnership between the Federal Government, academia, and the private sector, how do you envision that working really at the initial stages of research, right up into the creation of high-technology jobs? Is there any model that you would offer for how that might work?

Mr. HELMS. Well, I might respond. I had made remarks when you were out of the room that I think that is vital to have that link. And I made the statement that if that link does not exist, that maybe 50 to 75 percent of the work might be interesting but not of economic value. And that Sea Grant has played this role and has played it very well.

I think that is the reason that it has worked for us, because that link did exist between the scientific and the academic community and the business community, which was us. And through Sea Grant, the right type of R&D was done, the right type of development was done. If it had not been done, we would not have a company.

Senator KERRY. Dr. Burris, you talk about the disparity in the amounts of money that go into marine biotechnology. And I think you suggest that Japan is putting in $900 million to $1 billion. We put in $40 million. But are those figures, apples-and-orange figures, in the sense that you are talking about public investment in the United States, but I gather, both private and public sector investment in Japan? What would the funding level be in this country, combining the public and private sectors?

Dr. BURRIS. Actually, if you look at research, and this is data from 1991, and you look at the total research budget, the estimate is that private industry contributes less than 7 percent of the total, and the total is only about $44 million, so we are talking of a vanishingly small investment.

Senator KERRY. So, you are talking public and in private, $44 million is the total for both public and private investment?

Dr. BURRIS. And that was 1991. It has gone up a few million dollars since then, so let us err on the high side and say $50 million.

Senator KERRY. Why is there not greater emphasis put on marine biotechnology in this country? Do you have an opinion?

Dr. BURRIS. Well, there are a series of things that contribute to that. One I think is the traditional way that we approach the marine environment.

We have been very much an economy based on fish capture, return and consumption. In places like Japan there has been mariculture and aquaculture for literally centuries, so there has been much more of a sense of cultivation and utilization of the marine environment more than simply as sort of a hunter-and-gatherer economy, but an aquaculture agriculture.

So, the better parallel would be the way we have treated research in agriculture in our terrestrial crops, where we spend—the Science and Education Directorate, a part of USDA, has an annual budget approaching $1 billion in the Agricultural Research Service and the Cooperative States Research Service.

So, you see, it is a sort of cultural difference. We spend that type of money in terrestrial biotechnology and terrestrial agriculture. We have not traditionally viewed the marine system in that fashion, even to this day, and we have a limited amount of aquaculture that occurs.

Senator KERRY. While I was gone, did you get into any of the economic predictions of what you think could come out of marine biotechnology?

Dr. BURRIS. Well, I listed some, as listed in my testimony, I listed some of the opportunities that present themselves. I think it is safe to say that this will be a technology of the 21st century.

I elaborated in my oral testimony on material that does not appear in the written, which is what the Japanese are doing with regards to focused research, and the companies that are investing in marine biotechnology through this Marine Biotechnology Institute, and they include companies like Asahi, Fujitsu, Shisheido, Suntory——

Senator KERRY. What are they looking to produce?

Dr. BURRIS. They are looking at a broad spectrum, fine chemicals from the marine environment is one instance. Pharmaceuticals—Shisheido is a cosmetic company. Obviously, they are looking for cosmetics.

Chemicals, being able to culture algae and fish that can produce oils, a variety of commodity goods. They are looking for value-added products, not simply—I should not say not simply, but not just fish which we eat, but what can one derive with a much greater value added than fish? What can you get by way of products?

They are also at this institute doing a lot of work in bioremediation, a lot of work on biofouling, a major issue for defense and commercial shipping, and corrosion, and all of those things.

So, it ranges from the product that they sell to the consumer as a consumable all the way through value-added products as a base for a cosmetic, for example.

Senator KERRY. I assume Senator Stevens brought up the issue of the hybrid salmon.

Dr. BURRIS. Yes. I questioned whether it was sterile or not, so that is what we will have to find out in terms of his risk concern.

Senator KERRY. But are there not serious implications for all sorts of cross-breeding or genetic "tampering" that may or may not take place if such animals are released into the ocean?

Dr. BURRIS. I think this is an issue one has to confront head-on and carefully evaluate. I agree with you entirely. You have in cross-breeding the potential to produce a hybrid which may or may not be a problem, and what you have to do is make a decision based on the so-called phenotype.

Not the way it is made, whether it is made by genetic engineering and DNA is spliced in, but looking at the phenotype or what the characteristics of the organism are, and what impact it would have on the environment, and I think one has to proceed very cautiously.

Senator KERRY. Is there really any way to measure that?

Dr. BURRIS. We have a variety of ways, if I may use as parallel where we have a much greater experience, which is terrestrial agriculture, terrestrial crops, and I realize there are differences in terms of the ability to move, et cetera, but we can make reasonable predictions about hybrid species and hybrid varieties in the terrestrial system because we have had a lot more experience with it. In the marine, we are really novices and know very little about it.

We have essentially had few, if any, problems with genetic hybrids that are controlled and made. The problems have come with what I would call the introductions of exotics, foreign species.

The flag that is waved of concern is that we are going to release the new kudzu into the ocean. But one has to look carefully to see whether it is a foreign species or if it is a native species that has been only a limited change in its phenotype, or how it grows, or how it looks.

So, we have had experience, but not, certainly, as much as we should have, and that should be part of the research, not only the biotechnology to modify organisms, but the research to understand any potential impact.

Senator KERRY. Do you have a sense of where, economically marine biotechnology is headed? I mean, what kind of predictions you could make in terms of the market for goods produced with marine biotechnologies?

Mr. HELMS. Well, of course, I look at a fairly narrow part of the overall picture, but to give you an example, the entire seafood industry in South Carolina is about a $27 million a year industry, and by 1995 or 1996 we will be about a $30 to $35 million company, and so it shows that with the proper direction and proper technology, that one company can outgrow an entire industry, and South Carolina is known for its shrimpers and crabbers and other species.

So, I think if you look at it that the seafood that we produce or the shellfish that we produce are really in competition to a consumer, perhaps, of shrimp. So, he decides to order shrimp, or perhaps a clam if it is available. If the clam is not available he orders shrimps, and of course most shrimps come from mainland China and from Ecuador.

So, I think the economic value is definitely there, and I assure you that because aquaculture and the fishing industry is such an unstructured industry, made up of so many small companies, that

they will not be able to advance this technology. I think we all know from any industry that no industry has succeeded unless that basic R&D work and the technology transfer is available.

Senator KERRY. So, it can be treated like any other startup.

Mr. Silva, what about—are you familiar with any programs in other countries?

Mr. SILVA. Quite so, sir.

Senator KERRY [continuing]. That are really advanced in promoting this kind of technology?

Mr. SILVA. Just to give you an idea, and I am sorry you missed my earlier remarks on fish oils, but this is a 1-gram sample of 95-percent pure EPA and DHA. It is derived from menhaden oil. It is the same kind of thing that is being produced by the Charleston laboratory.

My cousin is head of science and technology for the AMA, and 10 years ago he told my wife and I, borrow as much money as you can from your parents and start a laboratory in New Bedford, MA, which we did, and we have been nothing else since then.

Senator KERRY. Nothing else but borrowing money. [Laughter.]

Mr. SILVA. That is about it, sir. If it were not for the fact that the Bagwell family of Georgia supports our research, and if we did not make money in poultry, we would not be able to stay in menhaden fishing.

It is a losing proposition from the terms of fish meal, but like so many of these industries—a good example is our ventures into aquaculture. We started Aquarius Aquafarms, which was the first salmon farm in Vancouver, which is a startup industry.

I remember going with my old boss up there, and we had the technology from Norway, and the Canadian banks would not even loan money to their own people, but the Norwegian industrial fund was willing to guarantee those loans, so we went back to Norway to get the Norwegian industrial fund to guarantee the loans that the Canadian banks made to their own citizens so that we could sell them fish meal and grow salmon up in Canada, and that started the entire salmon farming industry.

The threat of the loss of jobs has never been higher, sir. I would not be here, I would not be so adamant about what ought to be done, if I did not see everything—everything that Senator Pell worked for in Sea Grant—and I cannot tell you—I mean, I live in your library, sir—how valuable that marine biological laboratory at Wood's Hole is to this kind of research. We are watching the jobs evaporate. We are watching them go overseas.

What the Japanese are after, they are after this oil. This is the real Lorenzo's Oil, this is the real cure to cancer. This is the real, most significant, important part of the diet of children. It has to do with their retinal development, it has to do with their nerve development.

There is a conference right now that I could not attend in Lucerne, Switzerland, on these omega oils. You have heard Roy Martin come here before these committees from the National Marine Fisheries Institute and testify to this. You have heard scientists from the National Institutes of Health, doctors from Massachusetts General Hospital, everyone has been supplied with just about enough oil to get by with the mice, and we are at a point where

we need to go to clinical trials, and there just is not any raw material.

So, while on the one hand the fishing industry is strangulating and is dying—we have never made money in the menhaden industry. We had to close a plant in Mississippi, Moss Point, MS. We have never had more menhaden. The menhaden, the biomass of menhaden is constantly increasing, and yet we cannot tap into that because we need the technology to make this possible.

There is no mechanism. We cannot go to the Federal Government like the companies can in Japan. In Japan, the federal government and the industries and the universities, it is like a family.

Senator KERRY. How did you get hold of what you have there?

Mr. SILVA. You would not believe it if I told you. This was made in Japan. It was a gift. We have done——

Senator KERRY. How do they extract it?

Mr. SILVA. This is extracted by supercritical extraction, and I actually have work underway right now in Scotland. It is cheaper and easier to do—I am sorry, but it is cheaper and easier to do than in the United States because it is partially subsidized over there. You get some help. I mean, I get more help out of the Scottish Government than I am getting out of my own Government.

Senator KERRY. What do you need, when you say help? Give me a structure and give me an amount.

Mr. SILVA. I think there ought to be a focus, an office of marine biotechnology somewhere in which industry and academic communities and the Government could work together.

Senator KERRY. Do we not have that?

Mr. SILVA. No, sir, not right now.

Senator KERRY. I mean, we have it at Woods Hole.

Mr. SILVA. To give you an example, I live on the Cape. I mean, I am only a few minutes from Woods Hole. They are strapped. I mean, if you put together their resources it is just not enough to do the job, sir. That is the bottom line.

I started my testimony with thanks to NOAA for support of the Charleston Laboratory to make this product, but it is too little. They have basically a laboratory-scale process. It is not enough to get us into clinical trials, and we are going to lose this industry in the United States.

I mean, the menhaden—they are here. It was the first gift that the Native Americans ever gave to the pilgrims. I mean, if they had not given that gift, there would not be pilgrims on the shore. They would have starved to death and they would have gone away. That is basically it.

So, back to these very, very same basic issues. You know, the first oceanographers and marine biologists, people would like to forget, they were whalers. They did it for commercial purpose. I mean, they opened up a lot of new research—their bones are scattered across the globe—but they opened up the world of marine biology as it is known today. They opened up the world of oceanography as it is known today.

I find it very, very difficult, when I want to go out and find fish, we are spending $1 million a year now to fly planes and look around. We have boats. We know what kind of marine biological information can be gathered from boats.

But I think it is pretty crazy when I have to look at the Army Corps of Engineers, LIDAR, which has been built in Canada, which is being flown around by NOAA this summer, and have to stand, like, 10th in line to get to use this.

Because in Australia, using laser from an air platform to find fish and determine their biomass and to use a spectral scanner like Dr. Gary Borstat is in Canada to determine the health of the plankton and phytoplankton on the ocean, if you are a marine biologist or an oceanographer you can gather a whole lot more data for less cost per man-hour from space than you can from ships, sir.

I have got 10 180-foot boats. We know how much it costs to run boats, and you are right, the NOAA fleet needs to be modernized.

But one of the other Senators asked a very, very important question, and the question was, What is the priorities on the dry side versus what is the priorities on the wet side?

Well, you know, I do not know how many jobs, the Weather Service is going to create—but I know one thing, you ask the very important question, why these Japanese and Europeans—and believe me, they are spending just as much—why they are after this. This is the answer. This is new jobs, this is new technology.

There used to be conferences at MIT, and I think Senator Pell will remember these, and they were called Food and Drug from the Seas. Food and Drug from the Seas, and they had a conference every year on it, and people identified—I mean, like Ray Parris, and the marine collagens, there were hundreds of really bright and exciting ideas that were brought out that the group in Boston would kind of get together and they would come up with all these things.

They never went anywhere, but all of this information has not disappeared. All of these seeds which we planted, all of the work which was done by Sea Grants, unfortunately a lot of it goes overseas. Students come over here and they are sitting in the Pell Library and vacuuming up all of this information.

They go back home, and they get their governments and their industries committed toward process in these areas, whether it be aquaculture or biomaterials or chitins or any of the things that have been mentioned by the people at MBL. This is a very promising area.

Senator KERRY. Can you, without exaggeration and without reaching too far, give me a sense of the economic value of what you are holding in your hand, if we were to really deal with it and move forward?

Mr. SILVA. I think this oil will find its way, I hope—my only hope is that this oil finds its way into every chicken in the United States. That is all. I mean, it is not simply profit because there are a lot of children out there. You know, God was good to me. There are a lot of children out there that cannot afford $6 a pound flounder, $6 a pound scallops.

How are you going to get the benefits of the omega fatty acids into their diets? That is the question that they are asking over at the National Institutes of Health right now. How are you going to get them the benefits of eating seafood? We control this bioresource within our 200-mile limit, but we are not using its full potential.

Senator KERRY. What do you think is the economic value of that?

Mr. SILVA. In terms of jobs, it is beyond the numbers that we know of.

Senator KERRY. Well, how many people would be involved in processing——

Mr. SILVA. It is not just that, Senator.

Senator KERRY. What kind of sales do you think it would have?

Mr. SILVA. Hundreds of millions. It is not just that we are talking about. The start of a whole new industry, that is what we are talking about. The marine biotechnology as an industry, it is in its infancy. The seeds were planted by people like Senator Pell years ago, and we cannot even identify the compounds that are there in the sea.

Senator KERRY. How would you proceed? We have learned through deforestation and dessertification and other kinds of human-induced problems, that we can upset the ecosystem. I would assume that the science is not ready to predict the implications of massive use of such marine products. How do you balance the ecological concerns?

The same sort of balance is required that is necessary for the harvest of any other fish or marine resource. And I understand that. But if you move off into suddenly providing something, masses of phytoplankton, krill, various seaweeds, or whatever, and then start to harvest it in greater amounts than we are today, what happens to the overall balance? We do not really know the answer to that, do we?

Mr. SILVA. No, you are correct. And it needs to be studied. But I think that—I will give you an example. We went to look to acquire a company that was outside the Beltway in Washington one time. And I was in there to talk to this man, and on the board was a little thing about deuterated products. And I said, "What is deuterated products?" And he said, "Well, we have taken algae and we have grown them in heavy water." And he said, "But we cannot sell you this technology or the patents or anything else because the Department of Defense is using it." And I said, "Well, what for?" You know, growing algae in heavy water, what is the point of this? And he said, "Well, it is synthetic oil." And he said, "It is synthetic oil that is so strong that they put it in jet fighters and they get, for the same engine and everything else, 25 percent further distance on the same engine because it can burn hotter."

So, I mean here is a man who is an algae specialist and he is working in an area no one could foresee. He has opened up a whole entire new industry. At that time, you know, the DOD had it under lock and key and he probably should not have been talking to me about it. But it is difficult to say what figures.

Senator KERRY. No, I think you have shown us your enthusiasm and your passion about it, which is important. And I think you have described a good picture of the possibilities.

Dr. Burris, what do you say to what Mr. Silva is saying? What is your reaction?

Dr. BURRIS. Well, I will confess to a certain personal ignorance about how the omega oils will get into the chickens. Obviously, they have been discussed as very important and, in fact, have fueled a lot of the demand for the fish products when it first came

out that fish are good for you to eat, as an anticancer, et cetera. There is a market. How we will prove it, I do not know.

As you know, we have between a $4 and $5 billion a year balance of trade deficit with regards to fish products or seafood products in the United States. So, a lot of that is consumer driven by the perception that by eating seafood they will be healthier.

With regards to your comments about the economic estimate—anyone that gives you an absolute estimate is of course only treading very lightly in the area where they have knowledge. But if the Japanese invest $1 billion per year, we clearly have a perception of a market well in excess of $1 billion. And so we are talking about in the billions.

With regards to your question about the impact on the environment, many of these things, as I said before, are value-added products, not necessarily vast harvesting of the ocean, but, instead, deriving products. They could be waste products. They could be products that we are not using presently. So, I do not see this as being a massive fishing effort, for example.

The one example that does exist where we have derived through traditional biotechnology for many years products from the sea is the harvesting of kelp throughout the world, particularly off of San Diego. And it turns out that kelp is harvested and it grows back rather rapidly. And Kelco, the company, goes through with choppers and harvests almost as if it is an agricultural crop, and comes back and extracts the algin in this case.

The Japanese and others have extracted algae. We extract carrageenan. I do not see any major impacts with this controlled harvesting of that sort. But I would argue that most of the marine biotechnology, in fact, in many cases, is a substitute for wholesale harvesting of the marine environment and, instead, is promoting mariculture, aquaculture, making it economically more feasible, providing a product that is better.

So, I do not see that as sort of an impact for marine biotechnology, per se.

Senator KERRY. Well, I have been talking about the possibilities of aquaculture in this country for a long time. We are getting further and further along, slowly. When you measure what other countries are doing and what they have been investing over the years, we are way behind. And the potential is enormous. I mean, obviously, I think as the market shifts, also, and as we encounter problems with fishing stocks, we may see an investment jump, and the market may indeed have elicited an appropriate response.

But I do think you are right on target in highlighting the need for a much more significant governmental-private sector joint partnership here. And I am going to see how we can build on the efforts in the House and introduce legislation here that will help to do that. I think it will be a very important new frontier and one that begs our greater involvement.

I really want to thank you for taking the time to be with us today, sharing your commitment, and your insights on where the road could go.

I am going to leave the record open, because I am told some other colleagues may have questions. And we would obviously like to be able to follow up with you gentlemen, I think, as resources

as we try to develop legislation. There is a lot of room for contributions, and we look to you for them.

Thank you very, very much for being with us.

Senator Pell, do you have anything to add?

Senator PELL. I have just one question. And that is, 25 years ago we were all red hot about FPC, fish protein concentrate. Somehow we stumbled and failed in taking advantage of it at that time. We are now on the same threshold. How can we make sure we do not stumble this time? I think we may be more successful with legislation. But we have a 25-year gap that we should not have as you pointed out again.

Mr. HELMS. Thank you, Mr. Chairman and Senator Pell. I invite both of you and your staff down to Charleston, SC, if you would like to see the world's greatest and a world-class clam farm.

Senator KERRY. I would like to do that. I went out last year to Cape Cod. There is a terrific clam operation out there. I was just stunned by the culturing of these clams. I had a couple of dozen of them right there. It was plenty tasty. And it was quite fascinating to me to watch the process. So, I am well aware of the potential of those kinds of operations, and it is very, very exciting. No question about it.

I think in shrimp operations, and catfish down South, there are a lot of things we can be doing. The result could be a good food product available to a lot of people and providing jobs and income. So, I hope we will pursue it.

Thank you very, very much. I appreciate it.

We stand adjourned.

[Whereupon, at 11:45 a.m., the hearing was adjourned.]

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APPENDIX

QUESTIONS ASKED BY SENATOR PRESSLER AND ANSWERS THERETO BY DR. BAKER

Question. Could you explain how the Weather Service intends to implement the certification process required by the Weather Service Modernization Act, particularly with respect to South Dakota?

Answer. The certification process is explained in the National Implementation Plan for Modernization of the National Weather Service. This process is the same for all states, and the sequence of events leading to certification for a typical WSO consolidation or automation is designed to assure that services will not be degraded. The major steps in the certification process include:

- installing and testing the NEXRAD or ASOS;
- operationally demonstrating the unit and coordinating with users;
- commissioning the unit for full operational use;
- transferring service responsibility to the NEXRAD field office while continuing to operate the existing radar;
- confirming with users that services are maintained;
- preparing decommissioning and/or surface observation modernization reports;
- decommissioning the existing NWS radar;
- certifying "no degradation" of services; and
- consolidating (i.e., remove or replace the outmoded radar, and reassign the radar operators and/or surface observers to an office where needed).

In particular, in South Dakota, the Weather Service intends to locate the NEXRAD units to give complete coverage at 10,000 feet. This should lead to not only "no degradation of service" but also a significant improvement in services to the state over what can be provided by the current radars. Key events for South Dakota are listed below, with any event scheduled in 1996 or later designated as "96+":

WSFO Sioux Falls will become WFO Sioux Falls (new building at airport): 10/93 ASOS commissioned; 08/94 NEXRAD commissioned; 10/94 WSR-74C decommissioned.

WSQ Aberdeen will become WFO Aberdeen (new building at airport): 10/94 ASOS commissioned; 07/95 NEXRAD commissioned.

WSO Rapid City (at airport) will be consolidated with the WFO at the Rapid City site and eventually closed: 10/94 ASOS commissioned; 01/95 automation certification; 96+ WSR-74C decommissioned; 96+ service transfer to WFO Rapid City; 96+ consolidation certification.

WFO Rapid City (new office at Rapid City School of Mines): 96+ NEXRAD commissioned.

WSO Huron will be automated, consolidated with WFO Sioux Falls and WFO Aberdeen and eventually closed: 10/93 ASOS commissioned; 01/94 automation certification; 96+ WSR-57 decommissioned; 08/94 service transfer to Sioux Falls; 07/95 service transfer to Aberdeen; 96+ consolidation certification (after both transfers).

WSO Sioux City, Iowa, will be automated, consolidated with Sioux Falls and eventually closed (service area includes SD): 05/93 ASOS commissioned; 01/94 automation certification; 08/94 service transfer to Sioux Falls; 05/95 consolidation certification.

There will be no relocation certifications in South Dakota. The commissioning schedule for AWIPS and closure certifications for WSO Rapid City, WSO Huron, and WSO Sioux City will occur after 1996.

Certification documentation includes:

- A description of local weather characteristics and weather-related concerns that affect the weather services provided within the service area;
- A detailed comparison of the services provided within the service area and the services to be provided after such action;
- A description of recent or expected modernization of NWS operations that will enhance services in the service area;

- Identification of areas within a State that would not receive coverage at an elevation of 10,000 feet by the NEXRAD network (none in South Dakota);
- Evidence, based upon an operational demonstration of modernized NWS operations, that was considered in concluding that service would not be degraded from such action;
- A report prepared by the Modernization Transition Committee that evaluates the proposed certification; and
- If at an airport, an air safety appraisal conducted by the Secretary of Commerce in consultation with the Secretary of Transportation and the Modernization Transition Committee, determining that such action will not degrade service that affects aircraft safety (on closure only).

Question. What steps have been taken in this regard?

Answer. Weather Service staff have briefed a wide range of users, including media and local governments, on Weather Service plans in South Dakota. To date, office facilities are being prepared and systems deliveries begin later this year. As the modernization progresses in South Dakota, the Weather Service will follow the process outlined above.

Question. I understand that NOAA's budget request did not include funding for the Federal-State Cooperative Weather Modification Program. This program has been ongoing for several years and provides essential funding for six states to conduct ongoing research on atmospheric modifications. South Dakota is not one of the six, but South Dakota School of Mines and Technology, in Rapid City, participates through the North Dakota and Illinois component of the program. The research conducted includes analysis of thunderstorm data and computer modeling for cloud seeding experiments. Are you familiar with this program? Why didn't NOAA include further funding? Will some other federal program support this ongoing research?

Answer. The original Federal/State Cooperative Weather Modification Program funding was a result of a Congressional add-on to the FY 1979 budget. Starting with one State, North Dakota, the research program has grown over the intervening years to include six States (North Dakota, Utah, Nevada, Illinois, Arizona and Texas), with concurrent increases in funding. Traditionally, all funds provided by Congress for this program have been passed through to the individual participating states as grants, with minimal participation by NOAA scientists and managers.

Although the research conducted in the weather modification program has been good, this type of state oriented cloud physics and precipitation research is more appropriately the responsibility of the individual states receiving direct benefits. Therefore, funding for this program was not included in our budget request. Additionally, the National Science Foundation, in the past, has been involved in weather modification research.

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